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DEFENSE INDUSTRY BULLETIN

January 1969

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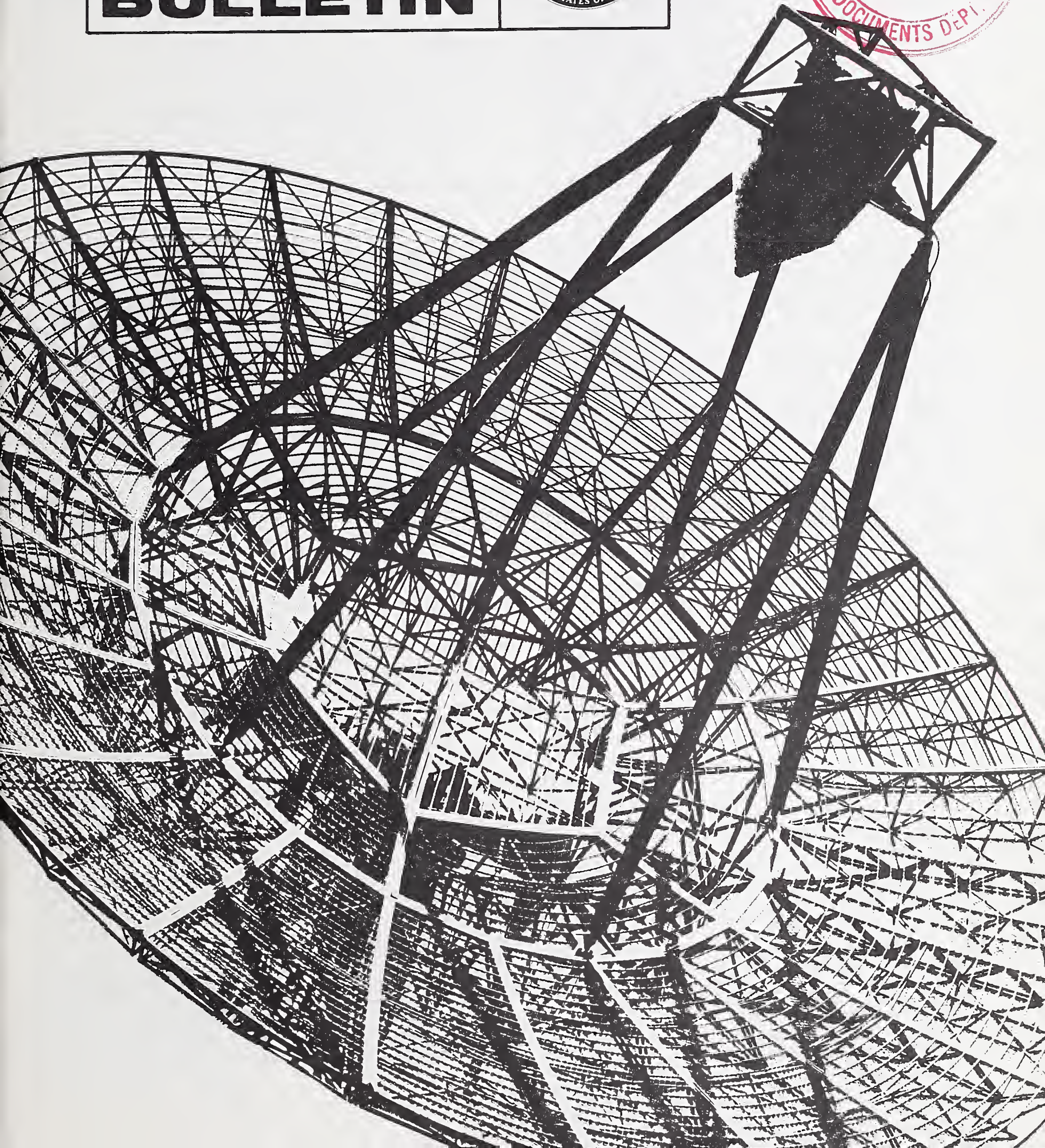

DEFENSE INDUSTRY BULLETIN

Vol. 5 No. 1 January 1969

Published by Department of Defense

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The *Defense Industry Bulletin* is published monthly by the Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication is approved by the Director, Bureau of the Budget.

The *Bulletin* serves as a means of communication between the Department of Defense, its authorized agencies, defense contractors and other business interests. It provides guidance to industry concerning official DOD policies, programs and projects and seeks to stimulate thought on the part of the Defense-Industry team in solving problems allied to the defense effort.

Suggestions from industry representatives concerning possible topics for future issues are welcomed and should be forwarded to the Editor at the address shown below.

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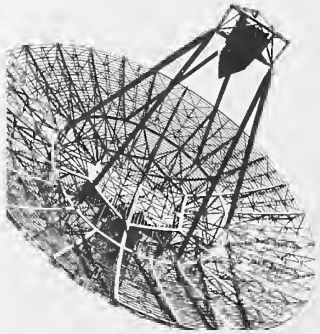


Ear to the sky. Permanent, semi-permanent and transportable antennas will listen to satellites relay messages around the world. Article is on page 7.

Uniform Policy and Guidance Established for Configuration Management

Edward J. Engoron
Albert L. Jackson Jr.

The aim of configuration management, like the larger processes of systems engineering management and logistics management that it supports and serves, is to enable and facilitate the timely conversion of a military need or opportunity to hardware that will perform as required, and that can be produced, operated and supported as planned.

This article is a summary of configuration management as it has been established by the newly issued DOD Directive 5010.19, "Configuration Management," July 17, 1968; and implemented through DOD Instruction 5010.21, "Configuration Management Implementation Guidance," Aug. 6, 1968. This configuration management policy will be applied to new contracts by means of four Military Standards and a specification which were developed concurrently with the policy documents.

What is Configuration?

The configuration of an item (or product) is a collection of its descriptive and governing characteristics, which can be expressed in functional terms, *i.e.*, what performance the item is expected to achieve; and in physical terms, *i.e.*, what the item should look like and consist of when it is built. In practice, an item being developed is described and governed primarily by its intended functional characteristics (with some physical characteristics usually being specified). Following development, however, an item being produced for inventory is ordinarily described and governed by its physical characteristics.

What Is Configuration Management?

Configuration management is a discipline which integrates the technical and administrative actions of identifying and documenting the functional and physical characteristics of an item during its life cycle, controlling changes proposed to these characteristics, and providing information on the status of change actions. Configuration management is thus the means through which the integrity and continuity of the design, engineering and cost tradeoff decisions made on technical performance, producibility, operability and supportability are recorded, communicated and controlled by program and functional managers.

Background

Prior to 1962, the management of systems and equipment characteristics—or configuration—was confined almost completely to controlling changes to production hardware via the approval of engineering change proposals (ECPs). Careful technical and management attention usually was given only to major design and engineering changes because of their visibility and impact on technical performance, and on program cost and schedule. However, other important problems were resulting from ECPs but were not given comparable attention because they were not so obvious, and because they did not impact quickly or directly on program objectives.

Configuration-related problems were most evident in programs for the production and deployment of large, complex systems. This led the Air Force, in 1962, to establish for internal use the first comprehensive policy and procedural guidance on configuration management (Air Force Systems Command Manual 375–1). In 1964, this manual was revised to incorporate the experience gained in its use, to improve control of item configuration during the development phase (since achieving approved item characteristics was the basis for program approval), and to provide exhibits for contractual application in development and production. Similar guidance on configuration management was issued by the Army in 1965 and by the Navy in 1967.

Early in 1964, the Logistics Management Institute (LMI) reported on its study of engineering change control practices. In addition to the finding that ECPs accounted for 20 percent of the dollar growth and 80 percent of all change actions (on the several large programs analyzed), LMI concluded that increased program costs were caused by failure to consider all the factors in making change decisions, by lack of uniformity in DOD change practices, and by procedures in use failing to assure prompt change processing, decision and implementation.

Later in 1964, at the DOD Conference on Technical Data Management, the Panel on Configuration Control/Change Control Documentation concluded that configuration management was essential to the successful accomplishment of major DOD programs, and that a large spectrum of development and production activities "depend heavily upon a clearly defined and strongly supported configuration management system."

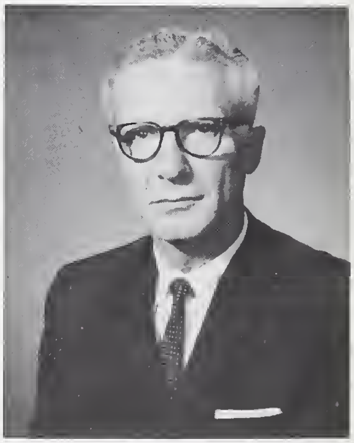
In June 1964, the Assistant Secretary of Defense (Installations and Logistics) and the Director of Defense Research and Engineering jointly initiated a comprehensive effort, with the participation of the Military Departments and the Defense Agencies, to establish more effective techniques and to develop uniform policies, practices and contractual documents for use in managing system and equipment configuration throughout the life cycle phases of development, production, operation and support. This joint effort, which included regular collaboration with all segments of industry via the Defense Industry Advisory Council (DIAC) and the Council of Defense and Space Industry Associations (CODSIA), has produced the policies and procedures necessary for effective configuration management. Many of these were adopted for use prior to formal issue of the policies. Emphasis now will be placed on their implementation, and on establishing the indoctrination and training programs that have been planned.

What Kinds of Problems Were There?

- **The total cost and other consequences of ECPs were not known at the time of approval.** Many ECPs and approvals evaluated only the change itself. Little assessment was made of the modification kits and other spares that would have to be procured and distributed (sometimes to many locations); whether test, support, or training equipment would have to be modified; the extent of revision to operating and maintenance practices, workloads, manuals, etc. Since the "advantages" of the change were stressed and its side effects were not known or presented, changes of marginal value were often approved.
- **Proposed changes were not evaluated promptly.** Other than changes to correct hazardous conditions, decisions of ECPs were frequently deferred. If a change was subsequently adopted, the delay caused larger retrofit programs, normally accompanied by higher costs.
- **Approved changes were not incorporated promptly.** Once approved, changes to items *in production* were normally made within a reasonable time. However, changes to items *in operational use* frequently extended over long periods of time, thus denying the user of the item the benefit on which the change was based. Moreover, operation, maintenance and logistic support of the item all were made more difficult because of the "mixed inventory" that resulted.
- **Responsibility and authority for managing configuration was diluted.** Frequently, there was no single individual fully responsible and authorized to make and enforce decisions on item configuration. The prevalence of committee type action, requiring at least a consensus and sometimes unanimity, caused undesirable compromises and delays in configuration decisions. Additionally, it was difficult to retain the configuration commonality that made possible effective and economical production and cross-Service logistics support of items procured for use by more than one Service.
- **Specifications were inadequate for configuration needs.** Guidance for the preparation of specifications was oriented to the procurement of standard production items, and thus was not adequate for the preparation of specifications to be used in the development and follow-on production of complex systems and major equipment. Methods were not provided for assuring that specifications to be used during development would be performance oriented, *i.e.*, that they would describe functional characteristics of items. Consequently, important functional characteristics often were omitted or not adequately described and quantified, while unnecessary design constraints, *e.g.*, physical characteristics, were prematurely specified.
- **Verified technical documentation was lacking when needed.** Policies and procedures in use did not assure that configuration technical documentation was accurate, or that it matched the item it described. Also, this data frequently was not available at the time it was needed for change-related design and manufacture operations, for quality assurance and acceptance inspection and, especially, for operational, maintenance and logistic support purposes.
- **The configuration of items in use was not known.** Procedures were not effective for identifying the approved configuration of items, or for determining the status of changes that had been approved or accomplished. Thus real knowledge of the configuration of items in use often was not available, making the maintenance and logistic support of the item difficult and more costly to perform. In some cases, the actual configuration of items, when deployed, mismatched with their operational interfaces, with serious effect on operational readiness.
- **Configuration practices caused misunderstandings and delays.** There were incompatibilities among and within the Military Departments in the configuration areas of policy, technical documentation, item identification (numbering), terminology, and ECP procedures. In addition to causing program misunderstandings and delays within DOD, this lack of uniformity was particularly burdensome for the large number of contractors doing business with more than one DOD customer.

What Is the Gain to the Parties Concerned?

DOD and industry both will benefit from the new configuration management discipline since it was developed with a full understanding of the need for practical solutions to the problems being experienced, and for an effective means of preventing their occurrence in the future.



Edward J. Engoron is Deputy Assistant Director (Engineering Management) in the Office of the Director, Defense Research and Engineering. He has served in several key positions with responsibility for developing maintenance engineering policies at the Office of the Secretary of Defense level since 1954. Prior to that he served as Deputy Director of Maintenance Engineering in Headquarters, U. S. Air Force.

The responsibility and authority for configuration management is now established clearly for all items, whether intended for single or joint use by the Military Departments and Defense Agencies. DOD and industry will know who to look to for decisions and information. When configuration managers tailor the policies, procedures and techniques that have been established to the complexity and life-cycle phase of the particular item to be managed, we can expect:

- Maximum latitude during item design and development, yet timely depth of configuration control needed for production and logistic support purposes.
- Earlier and accurate definition, documentation and tracking of functional and physical characteristics of items.
- Availability of verified technical data at the time and for the purposes needed.
- Quicker approval and implementation of worthwhile ECPs, waivers and deviations.
- Increased operational effectiveness of deployed items, and improved logistic support at reduced total cost.
- Significant reduction in the number and variety of data, forms and reports for managing item configuration.

Albert L. Jackson Jr. serves as Staff Assistant to the Assistant Director (Engineering Management) in the Office of the Director, Defense Research and Engineering. He is Vice Chairman of the DOD Steering Group on Configuration Management. He has responsibilities for policy, systems and procedures related to management of DOD engineering practices, including configuration management.

What Are the Essential Functions of Configuration Management?

While the scope and detail of configuration management is tailored to a particular item's complexity, life-cycle phase and quantity, these four functions are essential to managing an item's configuration:

- Identification and documentation.
- Audit.
- Status Accounting.
- Change Control.

The *identification and documentation* function is to assure the systematic determination of all the technical documentation (specifications, drawings and associated lists) needed to describe the functional and physical characteristics of items designated for configuration management; and also to assure that these documents are current, approved and available for use by the time needed.

The *audit* function is the comparing of an item with its current approved configuration as described in its technical documentation. Two kinds of audits are made: functional and physical. A functional audit primarily involves a review of an item's test data to verify that it will perform as intended, *i.e.*, that its functional characteristics satisfy those specified in the item's technical documentation. For items developed at government expense, a functional audit is a prerequisite to acceptance of the development effort. A physical audit involves the matching of an "as built" version of an item with its current approved technical documentation to assure that the documentation is complete and suitable for use in follow-on production, for accepting items produced, and for operational, maintenance and logistic support purposes.

Status accounting is the means through which actions affecting an item's configuration are recorded, and are reported to program and functional managers concerned. The accounting function identifies an item's initial approved configuration, then continuously tracks changes proposed to that configuration as well as the priority, schedule and progress of changes that are approved. Additionally, current information is provided on all other aspects of a change to a configuration item, *e.g.*, other hardware affected, operating and technical manual revisions, modification kits and spares requirements, specification and drawing updating, etc.

Change control is the most visible aspect of configuration management since the people in this activity evaluate and approve or disapprove ECPs, as well as requests for deviation or waiver of technical requirements. The purpose of change control is to prevent unnecessary or marginal changes while expediting the approval and implementation of the worthwhile ones, *i.e.*, those that are necessary or promise significant benefit to the Government. Such changes are those which will:

- Correct deficiencies.
- Significantly improve operational effectiveness or reduce logistic support requirements.
- Result in substantial life-cycle cost saving.
- Prevent slippage in an approved production schedule.

In addition to change decision making, change control includes the equally important functions of setting change priorities, *i.e.*, emergency, urgent, or routine, and of assuring that necessary instructions and funding authorizations are issued promptly for approved changes.

What Items Are Configuration Managed?

The selection of items to be configuration managed is determined by the need of the Government to control an item's inherent characteristics, or to control that item's interface with other items. Thus configuration managed items may be large or small, complex or simple.

In a missile system, for example, the missile itself, its guidance system, and its operational computer program each would be configuration items, and would be so identified in a contract (all configuration items are). Such a complex system may well require a highly organized configuration management effort to assure that the results of the systems engineering—the technical performance and design requirements—are systematically identified and documented, audited and controlled. In contrast, an item such as an electrical test meter (which may be procured for use in several systems) may require nothing more than specification control and acceptance inspection prior to entering the inventory.

A special case exists for items that are developed at private expense and procured "off the shelf." A decision to use a privately developed item recognizes that government control of the item's characteristics can and will be limited to "form, fit and function." This does not prevent the Government from testing (or examining test data) to assure that the item is satisfactory for its intended use, or from obtaining the technical data needed to service and repair the item.

When Does Configuration Management Begin and End?

For items developed at government expense, formal configuration management begins when the items are approved for engineering or operational systems development (contract definition, when used). If contract definition is conducted on an item, the configuration management of its subitems is deferred until the definition is completed.

For privately developed items, configuration management begins when procurement for inventory is initiated. Whether developed at government or private expense, the configuration of items is managed until they are removed from the operational inventory, including operational reserve storage.

Who Is Responsible for Configuration Management?

A single individual in a DOD component (Military Department or Defense Agency) is responsible and authorized to manage each configuration item. Where a system/project manager is assigned for the development or production of an item, he is responsible also for managing that item's configuration. In other cases, an individual by name, or the head of a functional office, is responsible for managing the configuration of designated items.

Where more than one DOD component is involved in the development, production, operation, or support of an item, one designated component is responsible for developing, negotiating, documenting and implementing plans and agreements for managing the item's configuration.

What New Aids Does the Configuration Manager Have?

- Authoritative policy and implementation guidance (DOD Directive 5010.19 and DOD Instruction 5010.-21).
- Criteria for selecting specification types for describing item functional and physical characteristics, and guidance for in-house or contractual preparation of these specifications (MIL-S-83490 and MIL-STD-490).
- Criteria and uniform practices for proposing, justifying and approving engineering changes, waivers and deviations and methods for their implementation (MIL-STD-480 and MIL-STD-481).
- A comprehensive listing of standard data elements for tailoring the selection of information to be recorded and reported on item configuration status (MIL-STD-482).
- Uniform terminology and definitions for configuration management (MIL-STD-480).

The new aids impact to varying degrees on a wide variety of configuration management policies, practices and procedures now in use. For example, at least 23 DOD component documents have been identified as providing configuration management guidance to their activities for internal use. Some of these documents may be consolidated or eliminated; the remainder will require some revision to reflect the improvements intended.

For contractual application, approximately 70 DOD component documents have been identified for use. Of these documents, 29 will no longer be authorized for use on new contracts; the remainder will be revised to be compatible with the new policies and practices.

Equally important, a basis has now been established to assure that any existing or new configuration management documents to be applied on contracts will be authorized by the Office of the Secretary of Defense prior to use.

In summary, the concept and principles of configuration management are not new. Primarily, what DOD has done, with considerable help from industry, is to identify, assess, improve and codify the logic and practice of configuration management, and to integrate it with the systems engineering management and logistics management processes over the entire life cycle of systems and equipment. Rational procedures and a discipline have been developed for this purpose. The payoff, however, is that these techniques will improve our ability to achieve the operational performance and readiness we need at the lowest total cost.

Modified Wind Tunnel Improves USAF Jet Test Capability

Techniques used by the Air Force in testing jet engines at simulated ultra high altitudes have been advanced with the installation of a liquified gas (cryogenic) cooling system in the large transonic wind tunnel at the Arnold Engineering Development Center in Tennessee.

Prior to the modification, valid flight conditions could only be simulated at altitudes less than 30,000 feet through a Mach number range 0.2 to 1.2 (130–780 m.p.h.). Altitude range has been extended to 90,000 feet with the new system.

Temperature conditions in the Arnold wind tunnel are normally controlled by a water-fed cooler system which limits temperature-matching to low altitude figures.

Until recently, the limited temperature-matching capability of the tunnel was not a handicap. True temperature matching was not critical in most conventional low-speed aerodynamic tests, and air-breathing propulsion system design was advanced enough to provide good performance without extensive test requirements.

However, testing of advanced air-breathing engines requires temperature matching over a higher altitude range than was available in the past.

Preliminary studies indicated that installation of a permanent conventional refrigeration system would cost more than $4 million. However, engineers of ARO, Inc., contract operator of the Arnold Center, designed a system which cost only $930,000 and used about $800,000 worth of surplus Air Force equipment.

The improved capability was attained by modifying the water-fed cooler to accept liquid-nitrogen-cooled mineral spirits. The airflow is further cooled by liquid air, a mixture of liquid oxygen and liquid nitrogen, which is directly sprayed into the flow from a hundred nozzles on two spray header manifolds just upstream of the test section.

The liquid air spray system was designed for easy installation and removal, and the heat exchanger can be rapidly converted to accept either water or the chilled mineral spirits.

Improved Performance Is Goal of Multiple Incentive Contracts

Francis J. Hines

The concept of performance incentives in government contracts is not new. It dates as far back as 1909, when the Wright Brothers signed a contract with the U. S. Army for its first aircraft. The details of the contract were quite specific: Carry two passengers weighing a total of 350 pounds non-stop for 125 miles at an average speed of 40 miles per hour over a 6-mile course, be assembled in 1 hour, transportable in Army wagons and able to take off and land in any unprepared terrain. There were other stipulations which indicated that the Government was being very precise about what it expected the contractor to produce. For all this, the Government would pay $25,000.

To make the work a little more interesting, Uncle Sam and the Wright Brothers agreed on a performance-incentive clause. For every mile over 40 the flying machine could average, the contractor would receive an additional 10 percent or $2,500. For every mile per hour under 40, the Government would deduct 10 percent. Under 36 miles per hour, the aircraft would be rejected.

The aircraft whizzed along at over 42 miles per hour, and the Wright Brothers collected a fee of $5,000 in addition to the contract cost of $25,000.

Since then, incentive measurements have become far more sophisticated. Today, a multiple-incentive contract's purpose might be to motivate a contractor to:

- Produce a product or service with significantly advanced performance goals.
- Meet or improve on contract schedules.
- Control and reduce costs.
- Complete the contract within a weighted combination of some or all of these objectives.

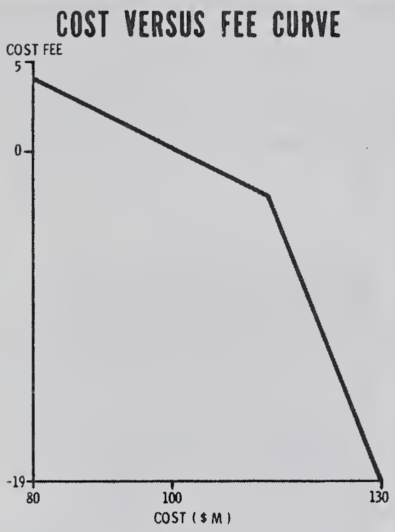
The contractor's risk is the potential addition or reduction of his fee (profit), based upon previously established measurements of his ability to control costs, performance and delivery. If the contractor is able to excel in these pre-established incentive measurements, the Government benefits by receiving the maximum level of weapon system effectiveness for the dollars expended. Of course, to be effective, a multiple-incentive contract must communicate the Government's objectives to the contractor. At the same time, it must motivate the contractor to achieve these objectives.

One of the Government's major concerns has been to determine, before contract completion, exactly how the contractor will interpret and act on the incentive matrix. This concern caused an association between the U. S. Air Force Academy and the Pricing Division of the Air Force Systems Command's Space and Missile Systems Organization (SAMSO) in Los Angeles. A research team, made up of members of the faculty and cadet wing of the Academy, was formed in 1963 to determine whether mathematical techniques could be developed to help analyze multiple-incentive contracts. For four years, this team conducted research part-time during the academic year and full-time during the summer. This research led to computer techniques which assist in evaluating existing or prepared incentive matrices and in structuring desired incentive matrices.

One of these programs, *evaluation*, produces a graphic tool which helps analyze both Requests for Proposals (RFPs) and existing contracts. For example, the cost-versus-cost incentive fee (profit) curve and the performance-versus-performance incentive fee (profit) curve are combined via the computer to obtain a set of cost-versus-performance tradeoff curves. Each curve depicts the various combinations of cost and performance that will result in the same fee. Analysis of these tradeoff or constant-fee curves provides a simple check to see if the proposed incentive matrix reflects the desired balance of emphasis among the incentive elements. Cost-performance nomographs are also generated as a further visual aid to tradeoff analysis. With these nomographs, a straight-edge can be used to determine the fee for a given cost-performance outcome.

Francis J. Hines is Chief, Pricing Division, Procurement and Production Office, Space and Missile Systems Organization. A native of Denver, Colo., Mr. Hines attended the University of Colorado and the University of Denver. The DOD-chartered Program Office for Evaluating and Structuring Multiple Incentive Contracts (POESMIC) is headquartered at SAMSO under his direction.

The second program, *structuring*, assists in developing an incentive matrix which reflects the Government's objectives. This program has two steps. The first, performance ordering, is a graphic, tabular tool which permits a check of the values of individual performance elements to ensure that they have been properly structured and weighted. To assist in this check, performance-versus-performance point curves are generated by the computer for each incentive performance element. These curves indicate the contribution of each of the individual performance elements to the overall performance rating. Performance tables, cost-performance equivalence tables, and performance nomographs are also generated. The performance tables express several possible combinations of the performance elements and their resultant aggregate values, and permit analysis of performance-element weights. Also, they define acceptable tradeoffs among the individual elements. Cost-performance equivalence tables add additional visibility by reflecting the performance incentive fee associated with each level of performance in the table, and the equivalent cost in development dollars which would offset the performance fee to be earned for the increased performance. Again, the nomographs permit various element performance levels to be connected to arrive at the point system which each unique combination within the performance matrix represents.


COST VERSUS FEE CURVE

The second step in structuring requires answers to the following questions:

- What is the value (worth) to the Government of increasing technical performance from minimum to par performance?
- What is the value (worth) to the Government of increasing technical performance from par to maximum performance?

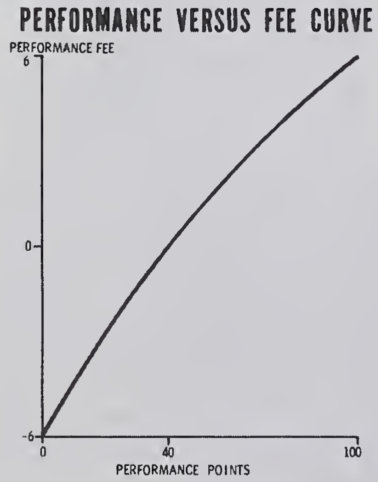
Answers to these value questions must come from the government buying office. There are a number of methods for determining these values. Two methods that have been researched and documented are the Cost-Benefit Method and the Cost-Performance Correlation Method. The former uses a systems analysis approach to determine the procurement and life-cycle operating cost savings to the Government for increases in technical performance. These projected government savings in procurement and operating costs are shared with the contractor through performance incentives, just as savings in development costs are shared via the cost-incentive arrangement. The Cost-Performance Correlation Method uses subjective judgment to arrive at and then check the answers to the value questions.

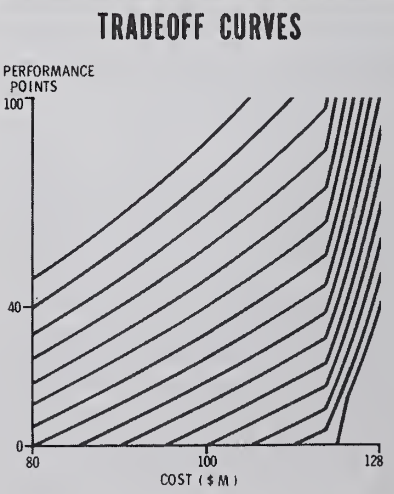
These values are combined with the cost-versus-cost incentive fee (profit) curve and the aggregate performance-versus-performance incentive fee (profit) curve, to computer-generate (as with the evaluation program) a set of cost-versus-performance tradeoff curves that portray the goals desired by the buying office. Once again, cost-performance nomographs are generated as a further visual aid to augment the tradeoff curve analysis.

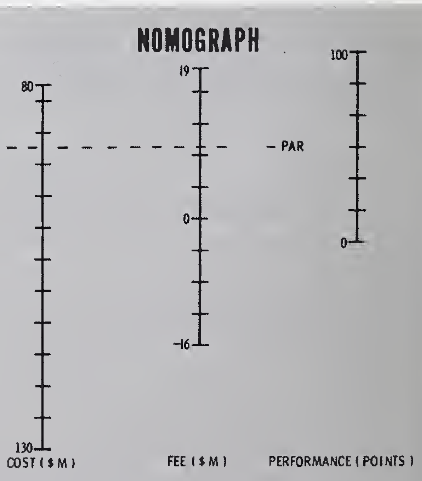
These techniques were so promising that the Office of the Assistant Secretary of Defense (Installations and Logistics) asked the Air Force to be the DOD executive agent. The Air Force placed the responsibility within the Pricing Division of SAMSO. That division's Program Office for Evaluating and Structuring Multiple Incentive Contracts (POESMIC) opened officially in Los Angeles on April 1, 1968.

POESMIC evaluates, structures and analyzes existing and proposed multiple-incentive contracts for the Army, Navy, Air Force and the National Aeronautics and Space Administration. It also gives technical advice to program users and conducts further research in advanced incentive structuring and related subjects.

(*Continued on page 24*)


PERFORMANCE VERSUS FEE CURVE


TRADEOFF CURVES


NOMOGRAPH

Defense Satellite Communications—Beginning, Progress, Future

Lieutenant General Richard P. Klocko, USAF

In 1950 the Encyclopedia Americana devoted only nine lines of print to satellites—all the information pertained to the astronomical bodies associated with the heavenly planets and Earth was credited with having only one. Over the span of not quite a decade, the technology of a modern, dynamic world has produced a new meaning. The satellite has taken on a complex and varied interpretation, not only in communications but in many scientific fields. In addition, the number of satellites surrounding the Earth has multiplied in significant numbers without regard to any fixed mathematical progression.

Efforts in communications by satellite began in earnest with the commercial "Early Bird" in April 1965, followed by the initial launch of the defense system in June 1966. Since that time attention has been applied not only on improving the capabilities of the initial system, but also to the needs of the future and the next satellite communications generation that is inevitably to follow.

During the summer of 1967, the Defense Communications Agency (DCA) was planning the communications advances that would be achieved by implementing an advanced operational satellite communications system. At that time, although the initial phase of the defense communications satellite project was nearing completion with notable results, it was recognized that this phase provided a limited system. The satellites are drifting and, consequently, do not remain mutually visible to a pair of earth terminals for long periods. Since significant gaps occasionally occur between satellites, long periods when satellite links are not available also occur. Additionally, current satellites are low powered and limited in bandwidth. Earth terminals, built as research and development models, are limited in capability and operational reliability. These limitations combine to provide very real boundaries to the utilization of the system. Only a new system, capitalizing on the latest advancements in technology, can overcome these limits.

With this goal in view, DCA, as the responsible agency in the Defense Department, began in 1965 to plan for a second generation Defense Communications Satellite Program under the guidance of the Office of the Director, Defense Research and Engineering.

After many months of mutually beneficial discussions at the Secretary of Defense level regarding an advanced system, on June 18, 1968, the Defense Department announced its decision to proceed with an Advanced Satellite Communications System.

This article discusses the new operational initial system, the recently approved Phase II and, finally, a look into the future for the Defense Satellite Communications System.

Before going too deeply into evaluation of the system, I should like briefly to address the question, "Why do we need a Defense Satellite Communications System?" As a matter of national policy, the need for a separate Defense Satellite Communications System is recognized by the inclusion of provisions within the Communications Satellite Act of 1962 that permits the creation of "... additional communications satellite systems, if required to meet unique governmental needs or if otherwise required in the national interest." This policy was reiterated by the President in his annual report to Congress on Feb. 15, 1965.

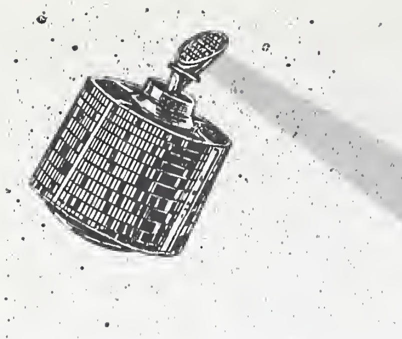
Consequently, a separate defense system is to provide features that are most essential to the military—features that differentiate the defense from the commercial systems—such as:

- Flexibility for rapid extension of service to new areas and the ability to reconfigure the system.
- Increased survivability from both electronic and physical attack.
- Reliability/availability to assure rapid special service.
- Security.

The Defense Department also needs a system to provide a capability to process types of communications, such as digital data and graphics, that cannot be processed by commercial systems, either for reasons of economy or security.

Initial Defense Communications Satellite Project (IDCSP)

At the present time, DOD has a rudimentary system—IDCSP—in use. It bears the same resemblance to the Phase II system as the Model-T does to the present automobile. The initial system is employed to fulfill operational Defense Communications System (DCS) missions on eight separate trunks. The DCS uses four types of ground terminals: the fixed earth terminal with 60-foot dish antenna, the medium transportable terminal with 40-foot antenna, the small transportable terminal with 18-foot antenna, and the small shipboard terminal with 6-foot antenna. There are currently three types of channel capacities: 11 voice channels on 3 trunks, 5 voice channels on 2 trunks, and single channel capacities on the remaining trunks. Satellite trunks are generally capable of passing the same type of communications traffic as are cable, tropospheric scatter, or microwave facilities.



Twenty-six standard satellites have been successfully launched for this system and placed in near-synchronous altitude equatorial orbit (18,200 nautical miles).

If any system may so be counted, this initial effort can be aptly classed as an inter-Service success story of the first magnitude. Under DCA's overall management, the Army supervised the development and installation of two types of earth terminals: the Hughes-made medium transportable and the Radiation Co.-made small transportable. The Navy supervised development and installation of Hughes-built shipboard terminals. The Air Force supervised development and emplacement of the Philco-made satellite space portion.

From 1966 until mid-1968, most of the system components were built, tested, emplaced, calibrated and, where necessary, modified and beefed up. All 36 terminals have come off the assembly line but a few have yet to be deployed. Personnel have been trained to perform the multitude of tasks associated with the system operations, maintenance and control. As any reader might guess, an effort of this size, involving considerable amounts of manpower and financial military and industrial resources, while successful in the long run, did not reach fruition trouble-free. Like most new complicated systems under development, it had its moments—or more accurately its months—of anguish and disappointment. Basically, however, it has fulfilled its purpose.

During the two years that elapsed between June 1966 and June 1968, the Air Force orbited 26 communications satellites; all but one have performed up to DCA standards. Five Titan IIIC launches were involved in all, with four of the five being successful.

Now circling the Earth at about 18,200 nautical miles altitude, all 26 communications satellites were injected into an equatorial, near-synchronous orbit. They drift in an easterly direction at a rate relative to Earth of about 24 degrees longitude a day. So that the satellites would not "bunch" closely together in space for long periods of time, they were ejected from their dispenser at slightly differing velocities, causing their orbits to be random. Moreover, these satellites were ejected in a manner that imparted perpetual rate of spin of approximately 150 revolutions a minute. Consequently, each satellite remains stabilized so as not to deviate more than plus or minus five degrees from earth's equatorial plane. Each repeater satellite uses two traveling wave tube amplifiers, one to act as an auxiliary backup to serve when the initial one shuts down. They function in the X-band frequency range.

Once orbited, these satellites enabled communicators to vault distances up to 9,000 miles apart between terminals. The more satellites that were added to the ring encircling Earth, the greater became the opportunity of gaining access to them. Thus satellite availability to earth terminals linking South Vietnam with the Pentagon improved from 92 percent in July 1967, when 17 working communications satellites were in orbit, to 96 percent now that 24 working satellites are in orbit.

Beside handling voice and teletype transmissions, the satellites and earth terminals comprising the South Vietnam-Pentagon link have, since late 1967, been successfully used for transmitting high-quality reconnaissance photographs of Vietnam. Moreover, they have experimentally demonstrated the feasibility of transmitting high-speed secure digital data traffic. On at least two separate occasions during late 1967, when certain vital submarine cables were temporarily out of service due to cable breaks, defense satellite circuits were pressed into emergency substitute use for carrying high-priority defense traffic ordinarily transmitted by the cables.

Initially the satellites were conceived to last at least 18 months and hopefully up to three years. Equipped not with batteries that would wear out but with solar array panels for generating their own power, the initial family of satellites was believed capable of squeezing out a few extra years of life beyond the maximum of three. They were endowed with a spare traveling wave tube amplifier to ensure that they would continue repeating communications traffic beamed at them long after the initial amplifier burned out. Despite the fact that, according to latest estimates, they may remain in orbit for as long as 10 years, they are doomed to die after six years of life; their electronic components are destined to switch off automatically at that time. This means that by 1972–73, out of the 26 now in orbit, only those 8 orbited in 1968 will continue to function. This means that, if DOD is to continue satellite communications for carrying unique and vital strategic communications, it behooves us to get something up there to replace them soon—by 1971—because all manner of things are apt to go wrong with them by then.

Follow-on Program to IDCSP

No matter how well the initial satellite system has turned out—and it has turned extremely well for the most part—a follow-on system is needed. There are very good reasons for this, not the least of which is the low 3-watt power output which limits communications capacity of the present satellites, and also the short life span.

Consequently, since 1965, DCA has been planning a follow-on program. Its objective is to furnish the National Command Authority and the Military Services with a future, high-capacity, secure, strategic communications satellite network endowed with an ever higher degree of reliability, flexibility, survivability after an attack, and immunity to enemy jamming. In the interests of economy, it is planned, generally speaking, upon the existing initial system earth facilities. The principal evolutionary advances are contained in the space elements of the system.

The new satellites will be equipped with earth-coverage antennas, and with steerable narrow-beam antennas. The so-called earth-coverage antennas will direct most of their radiated power toward the Earth so as to cover fairly uniformly that portion of the Earth visible to the satellite. The narrow-beam antennas will direct most of their radiated energy into two very narrow-beam illuminating areas on the earth's surface one to two thousand miles in diameter. The narrow-beam antennas will be steerable so that their beams can be directed towards any selected area of the earth's surface visible to the satellite. Although the satellite will be somewhat similar to the INTELSAT 4 now under evaluation by the INTELSAT Consortium, the narrow-beam antennas will have greater flexibility than those on INTELSAT 4 to meet changing requirements around the world. It is this uniqueness and flexibility of the Phase II satellite that differentiates the satellite of the future from the present-day military and commercial satellites.

General Objectives of the Phase II Program

Looking closely at the objectives of the Phase II program, it becomes apparent that we are shooting for an expanded version of the goals of our original system with a few extra dividends added for good measure. Phase II must handle securely, and in considerable volume, practically every form of electronic communications, including voice, teletype, computerized digital data, and video transmission. At all costs, Phase II must still support the National Command Authority promptly—instantaneously if possible.

It is for the National Command Authority that the most vital communications are transmitted, maintaining world-wide command and control between the White House, the Pentagon, the unified and specified commanders interspersed around the globe, and the commanders in the field. This is a two-way street, with intelligence and sensor data transmitted up the chain of command, and command and control directions passing down. It is important that these ends be served more expeditiously, more reliably, and more securely than today's system can do. We cannot afford long outages; a mere 15 minutes will have elapsed between the time a shower of nuclear-tipped ICBMs is first detected and the time it will impact. Phase II, moreover, must be more survivable to ground or air attack, as well as to enemy jamming, so that command and control information can continue to flow in both directions, preferably uninterrupted.

Much of what pertains to serving the National Command Authority applies equally to the general improvement needed in the Defense Communications System (DCS). Besides the crucial command and control data, a tremendous volume of data for military logistical and administrative purposes must be communicated through military channels when commercial communications facilities are not available. In this regard, DCA is striving to exploit an optimum "mix," or ratio of resources, whereby the "unique and vital" traffic of the DCS will use military facilities, including the Phase II satellite network, leaving approximately two-thirds of defense traffic to be carried by commercial facilities. The latter also includes satellites, as indicated by the 46 satellite circuits leased by DCA from the international record carriers in the Pacific, and six circuits, with more yet to come, in the Atlantic.

One of the major extra dividends desired from Phase II comes in the area of tactical communications—something people in the strategic communications business shy away from less and less these days. Phase II is expected to lend itself to communications between small portable terminals. Phase II is also expected to facilitate world-wide contingency communications, whereby entire new regions can be swiftly reached by communications in emergency situations. In yet another "unique and vital" category, Phase II ought to appreciably expedite restoral of DCS service customarily transmitted, but temporarily disrupted, through landlines, submarine cables, tropospheric scatter facilities, and HF stations. HF military communications, incidentally, are expected to decline in the near future as digital data transmissions grow to replace them. Phase II will play no small role in this decline.

Space System

What hardware will comprise the Phase II program? Some information cannot be divulged for security purposes, and for the simple reason that some hardware has yet to be worked through the research and development stages. Indeed, Requests for Proposals are being issued this fiscal year, therefore, any discussion of design details is premature.

It can be told that DCS intends to use the tried and proven class of synchronous satellite. Orbited at 19,200 nautical miles altitude, in an easterly direction, several of them distributed around earth's equatorial plane will function as "fixed" stations relative to earth's position. At this stage we have not decided if we will orbit three, four, or more—so much depends upon funding, on the future capabilities of the earth terminals, and on the number of "standby" satellites authorized as replacements.

If anyone thinks there is nothing new about DCA's forthcoming Phase II synchronous satellites, he is right in part. Certainly there is ample precedent: a pair of NASA-produced, DCA-manned satellites named SYNCOMs II and III, which have been orbiting quite synchronously for years. They can continue orbiting until they run out of gas. So there is no question about it, the mechanical aspect of the space platform is happily within the state of the art.

DCA's Phase II synchronous satellites will differ, however, in the quality and quantity of their performance, besides the way in which they perform. Being synchronously positioned and steerable from the ground to help keep them "fixed," Phase II satellites will no longer be subject to periods of "bunching" or of opening holes in the ring, which lessens satellite availability appreciably. Rather, ground terminals will be assured of practically 100 percent accessibility during their allotted time-periods on station.

Whatever number of satellites are orbited synchronously for Phase II, they must be higher powered. They must provide global coverage from 70 degrees south latitude. They must enjoy a relatively long life span. They must contain ample gas for rapid repositioning and maneuvering as re-

quired to support contingency plans. What's more their repeater bandwidth and multiple access capacity must be appreciably increased because not two terminals but scores of terminals will communicate through them simultaneously. To facilitate this, each Phase II satellite will be equipped with two types of antenna: an earth coverage antenna, directing most of its radiated power towards Earth so as to provide uniform coverage to all "visible" terminals; and a narrow-beam antenna that focuses its energy into a narrow beam covering a circle of Earth's surface with diameter of from 1,000 to 2,000 miles.

The narrow-beam antenna must be steerable in order to point it from area to area, as the need dictates. The small portion of earth's surface thus illuminated will consequently receive 100 times more power than this same area would otherwise receive, enabling use of small, portable terminals for contingency as well as strategic purposes. Both antennas would handle hundreds of equivalent voice channels at a time. The concentration of radiated power provided by the narrow beams will enable us to establish these channels to selected transportable small-size earth terminals. This will give the capability, should the urgent need arise, to quickly deploy terminals into new theaters of operation and rapidly establish vital communications into and within the theater to connect the headquarters of major commands or authorities. This capability can be used to supplement and augment the capacity of the DCS in a "day to day" mission mode and also cover contingencies. This will give us a new but very important option. Experience gained in Southeast Asia and elsewhere gave a greater and clearer appreciation of the role that high quality, rapidly established communications channels can play in contingency situations. Although hundreds of millions of dollars have been spent in the procurement, construction, and installation of long-range communications, full communications capacity has often lagged months behind the buildup of forces. The Phase II satellite, with its narrow beam steerable antennas and smaller highly transportable terminals, will hopefully give a capability for rapid buildup of command communications in contingency situations wherever required.

Ground System

Turning to the Phase II terminals, we can now get back down to Earth. But here the ground is more tenuous than solid, because what is known about Phase II terminals is evenly matched by what is not yet known. It is known, for example, that the network of Phase II terminals will use the existing 36 initial system terminals in an upgraded condition. Some of them, the 40-foot and 60-foot ones at least, will be improved to handle up to possibly 60 equivalent voice channels apiece and simultaneously. Furthermore, additional terminals will be bought so that total Phase II terminals will about double the number employed in Phase I. DCA wants to buy more of certain types of initial terminals, and wants to develop an advanced shipboard and an advanced airborne model—the latter for use in the airborne command post. DCA wants to procure a batch of highly transportable terminals to further enhance redeployability in support of contingency operations and survivability.

Now we come to the unknown. It is unknown precisely how many terminals DCA will get, or of what types they will be. It is unknown what modifications to apply to existing terminals, or what modulation and multiplexing subsystems to exploit. These matters, and others, are all under study, with a view to arriving at a versatile, reliable earth terminal network best capable of exploiting the Phase II satellite environment. As procurement plans are firmed up, more information along these lines will be released. Not to be overlooked is the Phase II control system, which is likewise in the study stage, and about which information will also be disseminated when plans become firm.

Future

What of the future? To borrow an old theatrical expression, is this really a "tough act to follow?" Perhaps it is, but I believe that Phase II only sets up the basis for even greater accomplishments in the years ahead. Although Phase II should continue well into the 1970s, advancements in the state of the art will presumably continue to occur, and thus thought should begin now as to how best to meet the next generation requirement that is sure to come. We at DCA will continue to keep abreast of technological improvements with a view to ever expanding and improving the Phase II capability. In this regard, we will be anxious to improve "on board" signal processing. Eventually we would like to have a direct satellite-to-satellite communications relay capability. We would like also to exploit higher frequencies, if at all practicable. Possibly, we might like to reorient the entire pattern of satellite communications from the frequency division to the time division mode of transmission. There is much that can still be done, presenting a challenge for both DOD communications managers and industry.

The ability of DOD to meet the overall program objectives and fully optimize the satellite communications technology in the Defense Satellite Communications System appears to be limited only by the imagination and resources applied by both industry and DOD. Collectively, we have the technological "know how" to plan, engineer, and produce a Phase II system of satellites and earth terminals at greater cost effectiveness, but with more performance, increased reliability, and improved maintainability.

Lieutenant General Richard P. Klocko, USAF, is Director, Defense Communication Agency, and Manager, National Communications System. In prior assignments he was Commander, Air Force Communications Service, and Air Force Security Service. He is a 1937 graduate of the U.S. Military Academy, West Point, N.Y.

Guidance—A Maturing Technology

Address by Gen. James Ferguson, USAF, Commander, Air Force Systems Command, at the Fourth Guidance Test Symposium, Holloman AFB, N. M., Nov. 6, 1968.

Since the technical subjects of this conclave should be adequately covered at the panel sessions, I thought that my remarks today might concern broader issues with relation to inertial guidance technology and its systems.

"Without a guidance system, a missile is nothing but a vast pyrotechnic display."

In this remark lies the very "heart of the matter" concerning not only missiles, but every target-aimed vehicle in our inventory, present or future.

Whether the target is a point on earth or a landing area on the moon, the "miracle steering" of an inertial guidance system or inertial navigation system must be the vehicle's way of getting there.

It is the concern of the Air Force, and the Systems Command in particular, in seeing that both offensive and defensive weapons hit their marks, that their missions end at the proper destination, at the proper time, with the specified accuracy. It is also our concern that these weapons contain the best available guidance systems, that they be cost effective, and that they have a reliability far in excess of anything we have ever experienced.

A tremendous number of the communications that come across my desk today concern guidance. The operational commands seek the ultimate passive system. The systems analysts in DOD place a very high significance on cost effectiveness. The theatre commands want the most reliable systems.

It is the business of the Central Inertial Guidance Test Facility at Holloman AFB and the Systems Command headquarters at Andrews AFB to satisfy everyone in these aspects. I just mentioned that one of the areas of our concern is the ultimate inertial guidance package. We are far beyond any nation in the world—free or enslaved—in this technology, perhaps by years. However, we developed the first such system in 1950—the XN–1. It guided a C–47 to a preselected target, effected a 180 degree turn and brought the plane back to base. That was 18 years ago. At the same time, our fastest experimental aircraft were only capable of speeds up to about 800 miles per hour but today our X–15 has flown over 4,500 miles per hour. That is almost six times as fast. Are today's guidance systems six time better than the XN–1 I realize that they are better—tremendously better—but we have not yet arrived at the pure passive inertial system. This would be six times better.

I hear a lot of talk about our approach to a technical plateau, that because we moved so rapidly in this field and are so far ahead, we can afford to turn on the auto-pilot and relax a bit. This is a dangerous state of complacency. We cannot maintain the *status quo*, and I include slight advances as being *status quo*.

We need quick-reaction, inertial navigation techniques that will reduce our current reaction time required for a one mile-per-hour accuracy. We need a low-cost air-to-surface missile midcourse guidance system that will sell for $3,000 rather than $15,000. We need coherent, side-looking radars to meet the offensive and recce missions. I could cite a dozen other requirements ranging from pure inertial through combined, inertial-electromagnetic to pure electromagnetic. We need more than we can get—faster than we can get them—now.

I just returned from the Farnborough show in England. From what I saw and from what I have learned, the Soviets are working night and day to upset the *status quo*. There are a number of possible advances or even breakthroughs that would give them decided advantages over us. We would be most unwise to let them take a lead in technology through our own lack of decisive effort. We must, at all times, maintain a technical momentum in order for our nation to maintain adequate strength across the entire spectrum of deterrence.

Gen. James Ferguson, USAF

To maintain this momentum does not mean that "price is no object". To the contrary. We cannot spend all our money on guidance hardware. The Systems Command, as well as the systems analysts in DOD, is more than ever thinking along cost-effective lines. This is for good reason. I might cite one example. A $2 million missile contains $800,000 worth of guidance and control hardware. Frankly, this is too expensive. The Air Force must insure that the best combination of economy and performance be the prime requisites in the procurement of inertial equipment—not just performance.

Without question, the application of two considerations is necessary: the all too familiar state of the art with regard to performance, and the less familiar state of the economy with respect to cost. For too many years, these have been the only considerations in determining technical acceptability and the low bidder. All too often, this has resulted in the purchase of equipment which appeared very attractive from the standpoint of initial cost but ended up in excessive funding for operational support. Particularly I have in mind one type of fighter whose guidance systems costs the Air Force $20 million annually because of one specific part that constantly requires maintenance.

We have a study under way to determine the feasibility of placing inertial system procurement under an approach similar to systems planning and management.

If this technique is adopted, the state-of-the-art considerations will not only include the present requirements such as accuracies, reaction times, power, weight, size, etc., but also reliability and maintainability. The state-of-the-economy considerations, in addition to initial costs, will include complete user costs with respect to user rate, pipeline time, repairs, maintenance, requirements for additional systems and spares, and inventory control.

All these factors will have to be considered even as early as during the advance development stage rather than after. If we have to go this route to bring cost within reason, we shall.

As you are aware, I included reliability in the state-of-the-art considerations. Every morning at my staff meetings I am provided with a rundown of every aircraft accident in the Air Force. All too often these accidents occur because of the failure of one 69-cent part—a pin, a washer, a diode or potting compound. All too often the failure occurred somewhere in the guidance system. Some of our planes cost more than $6 million. Regardless of that famous World War II phrase, they are *not* expendable, and neither are the pilots. Especially not for 69 cents.

The keys to improved reliability are the retention and utilization of experience and quality workmanship. We have all traveled a long, hard road in the electronic systems reliability effort. There has been massive documentation of our reliability efforts, but we have still not gone far enough in providing the factual documentation that insures us the use of experience gained and gives us the raw material for effective quality assurance. The failure of those 69-cent parts attests to this. We have not gone far enough with directive policies, the sinews of sound, effective reliability control.

I say "we" because industry and the Air Force are a team in the inertial guidance field, and we both share big stakes in the success of our joint efforts.

Basically, however, reliability is the responsibility of the contractor, the man who makes the hardware. Reliability should be an inherent built-in characteristic of the finished product. It is not an extra premium, but a basic requirement of contract performance. It is becoming an increasingly important factor in contractor evaluation and source selection, now that the industrial base, particularly for electronics and guidance procurements, has broadened, and the records of proved past performance are available to us.

I have no doubt but that the future problems associated with the reliability of guidance will get more difficult. Systems will be more complex, have more subsystems and, in turn, more components and more parts. There is an added importance to reliability. Each system has more capability than its predecessor, and thus has farther reaching effects, both in success and failure. Reliability must be assured when the system is delivered, not later. If we get a system today, then spend two years to modify it or alter it to make it operationally acceptable, we end up with a 1968 system in 1970. This is not acceptable. Our competition with the iron and bamboo curtain countries is too grim for this.

We must insist that industry continue to face the necessity for making reliable, operationally-acceptable sys-
Force. He stated our policies and re-
tems on time.

I would like to conclude with some remarks by Dr. Joseph Charyk, former Under Secretary of the Air
quirements very succinctly. He said:

> **With the pace of modern technology, and with the criticality of superior military capability to national security, to be second may well be suicidal. The key then is a combination of simple, but difficult, things—a mature judgment as to the areas of critical importance, a willingness to take calculated development risks, a solid determination and will to terminate promptly or re-orient programs where new factors have changed the tenets on which the program was launched, an assertive and prompt response to new and challenging possibilities, and a willingness by industry and Government to experiment with new contracting and management methods with premiums for performance and penalties for malperformance.**

We must be realistic about the problems confronting us. We must be equally realistic about the actions we can take to solve these problems. Over the past 18 years we have met and mastered a host of staggering problems in the field of inertial guidance. In the same spirit, I am confident we can meet the challenges facing us now.

Weapon Systems Trends in the Army

Address by Lt. Gen. F. J. Chesarek, USA, Asst. Vice Chief of Staff, U. S. Army, at the Luncheon for Sustaining Members of the Association of the U. S. Army, Washington, D. C., Oct. 30, 1968.

I would like to share with you a parable written by Benjamin Franklin in which he described how to make a Striking Sundial so that all the neighborhood for 10 miles around could know the time when the sun shines without having to look at the dial. In short, Mr. Franklin proposed:

> **In an open field with no impediment to sunshine, mark out hour lines, as for a sundial. On the line for one o'clock, place one cannon; on the two o'clock line, two cannons; and so on. The furrows must all be charged with powder, but ball is unnecessary. Around the sundial, place lenses to light powder trains; number one, for example, at one o'clock would fire one gun. At two o'clock, a focus shall fall on line two, kindle another train, and discharge two guns successively; and so on.**

Mr. Franklin then notes that the chief expense will be the powder; the 78 cannons, once bought, will with care last 100 years, and there will be a great saving of powder on cloudy days. He then concludes:

> **Kind reader, Methinks I hear thee say that it is indeed a good Thing to know how the Time passes, but this Kind of Dial would be very Expensive; and the Cost greater than the Advantage. Thou art wise, my Friend, to be so considerate beforehand; some Fools would not have found out so much 'til they had built the Dial and try'd it.**

Franklin's admonition to weigh cost against advantage now falls under the terminology of cost effectiveness, a new tool of management science.

Today, the protagonists of such a sundial would also consider tradeoffs. After satisfying themselves of the advantages to be gained versus the costs involved, they might propose surrendering a quantity of watches, clocks and other model sundials equal in value, after discounting, to the investment and operating cost of the new sundial over a period of years.

Needless to say, this concern for the cost of introducing a new system into inventory has a profound significance to both the Military Services and to industry. Its implications are great. They extend into force structure, doctrine, and manning levels, as well as into equipment inventories.

In my article written for the Association of the United States Army *Green Book*, I used the case study of the AH–56A—the Cheyenne helicopter gunship—to illustrate the concept of equal cost tradeoff. I would like to use it again now, very briefly.

To field this new helicopter at the earliest practicable date and to take advantage of certain contract option prices, the Army in the spring of 1967 requested authority from the Secretary of Defense to initiate its procurement. The Army recognized that, in the long run, the new capability provided by the AH–56A would permit some tradeoff of other systems already in the inventory. The Secretary of Defense agreed that the system should be introduced but concluded that the Army should identify and trade off other systems so that, over a 10-year period, the cost of the Cheyenne system would be offset by the cost of the tradeoff.

The Defense Department employs the technique of equal cost tradeoff to encourage the uniformed Services to exercise their best judgments and analytic capabilities in recommending the best mix of forces and weapon systems.

In considering the future application of tradeoffs, we must examine the course of the Army's doctrinal evolution to get a feel for the size and shape of the Army of the 1970s and 1980s. You will note that this evolution is not based on any really new concepts; rather, it is a matter of emphasis on proven principles, some of which have roots going back to Biblical times.

I have singled out eight trends which, in my view, dominate our professional landscape:

- **Night operations.**

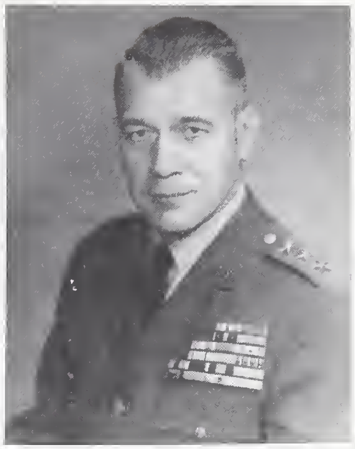
Night operations will become much more extensive and meaningful as night vision devices continue to improve. This opens new spectrums of tactics, type and density of equipment, intelligence, target acquision, and command and control. Equipment-wise, we must consider three aspects: needs of the individual soldier, combat surveillance, and target acquisition. Work in all areas is being pushed hard, with emphasis on the immediate needs of our forces in Vietnam. For a classic example of night operations, we can go back to Alexander the Great's victory in 326 B.C. at the Hydaspes River in India. What we are talking about today, however, is new in the sense of common versus unique doctrine. This field of endeavor holds as much promise for the Army as TV did for the communications media 20 years ago.

- **Tactical air mobility.**

The advantages of tactical air mobility have been proved, and the practice is certain to be expanded with unlimited scope for innovation. This includes not only the capacity to move people and materiel of all types, but also surveillance aircraft functioning under any kind of operating condition and gunships with a 24-hour, all-weather capability. We must also increase aircraft survivability and reduce vulnerability, especially to fire. While only about 24 percent of our aircraft accidents result in fire, about 75 percent of all fatalities resulting from aircraft accidents are caused by fire.

- **Equipment weight.**

Weight is an impediment to battle.



Lt. Gen. F. J. Chesarek, USA

This applies across the board. Although this fact was not just revealed yesterday, it is receiving priority attention. Weight has a direct bearing on the tactical air mobility point I just made, and it goes considerably further. We have moved aggressively in the area of individual equipment. We are now looking at the total spectrum. Tactical mobility is the sum of many factors. We relearn this lesson every time we engage in combat—and unlearn it in peacetime when we become enamoured with the niceties of luxury and gadgetry. In this regard, industry tends to egg us on, producing visions of compound use machines capable of performing miracles. And we are guilty of falling prey to wishful thinking — of disregarding lessons we learned the hard way. We need less of this sort of thing.

- **Target acquisition.**

Delivery of heavy firepower at point targets in very short time spans is highly productive. Ways are being sought to improve the means and techniques of application. This includes the need for improved target acquisition systems of all types—radar, electronic devices, and direction finding systems. A key consideration here is the improvement of accuracy. With better accuracy, ammunition consumption is reduced and a big cumulative pay-off is produced.

- **Logistics support.**

Entirely new logistics support systems are evolving based on the computer, airlift and containerization. I have long felt that we in the Army have not capitalized on industry's proven capability to assist us in this complex business.

- **Command and control.**

Advances in communications and data manipulation capability are revolutionizing command and control. From the division level up, computers will be used to store enemy and friendly unit data, visually display the tactical and logistical situation, and assist in decision making by evaluating proposed courses of action and presenting a list of most to least favorable. The computer's capacity for storage and rapid computation can also be applied to a multitude of other tasks. For example, commanders can use the computer's help in evaluating combat readiness, supply capabilities, and intelligence.

- **Equipment reliability.**

Reliability of equipment is becoming an absolute necessity as maintenance becomes more complex and costly. Designing with maintainability specifically in mind is increasingly important, as is more sophisticated and reliable diagnostic equipment. We must be prepared to pay for this product in initial investment costs, confident that in short order we will be able to amortize the investment by savings in logistics support and manpower.

- **Manpower costs.**

There is a growing realization of the total cost of manpower. This realization leads to pressures to get more utility from each soldier and to reduce the numbers needed.

These trends—I have enumerated eight, but there are others of significance—will be the Army's bench marks in calculating its future needs and in applying tradeoffs where required.

I would like to expand a bit on total cost of manpower, since it is the dominant cost factor in weapon system cost-effectiveness analyses.

The average annual base pay of a soldier is approximately $3,000. To this must be added the cost of his individual equipment, his retirement and insurance benefits, his upkeep, food, medical support, housing, etc. Thus, the total annual cost averages out at $6,830. As most weapon systems have at least a 10-year life, we equate their manpower element for a similar time span. Our single soldier cost now becomes $68,300 in a weapon system life cycle. With a thousand soldiers—roughly, only one battalion—that means $68,300,000. We can buy a lot of hardware for that kind of money, if it can be manned and serviced with substantially fewer people than the hardware being traded off.

There is still another aspect of post-Vietnam weapon systems introduction that is of special concern to industry. I call it cost constrained programming.

It is quite clear to me that the end of the Vietnam war will be accompanied by two conflicting resource positions. On the one hand, the Army can expect to be pressed hard to reduce its spending. At the same time, some of the new systems, such as Sentinel, Cheyenne, and MBT–70 (the new main battle tank) will be reaching the production stage with their high price tags.

Cost Constraints

That portion of the gross national product which is devoted to defense appropriations may be considered an expression of the American public's concern with the perceived threat to our national security. The percentage varies from year to year, but a general trend can be observed over time (barring a general war situation) which establishes a limit to the amount the nation is willing to spend on defense. In the non-war years, within the Army's portion of the defense appropriation, we have been spending about 20 percent of our dollars for military hardware and ammunition. If we start with the limits we can derive from an economic analysis of our budget projections, we may find that priorities are easier to establish for the total mix of our hardware.

As an example of how this type of analysis can constrain a single developmental system, it may be useful to look briefly at the case of the mechanized infantry combat vehicle, a member of the combat tracked vehicle family. The armored personnel carrier currently in the Army inventory was developed in the late 1950s. It was introduced in quantity in the early 1960s. As a rule of thumb, it is reasonable to expect a major item to have a useful life of about 12 years. On that basis, we should now be along the road toward development of a personnel carrier to be introduced in the mid-1970s. The Army has, in fact, established the military requirements and obtained data from industry which has shown us some attractive designs. These promise to give us more room for our infantrymen and their weapons in a much higher performance vehicle that should be able to live quite a bit longer on the battlefield and, at the same time permit more tactical innovations than our current carrier. However, the new carriers cost quite a bit more money. They cost so much more, in fact, that we sent a requirements group back to the drawing board to give us a greater visibility on each improvement feature. We want a vehicle with performance characteristics meeting our most desired requirements and at a total systems cost which can be defended. We also want a vehicle that can be procured in priority competition with other systems.

This example illustrates only one of the techniques which we must refine. We must also examine procurement schedules for high cost programs and examine operating cost savings versus procurement expenditure tradeoffs.

Turning now to different approaches, we must improve our ability to tap the resourcefulness of industry along the path of product improvement, which offers substantial pay-offs for relatively small investment. Another path—a path that is somewhat overgrown because it has borne insufficient traffic—is the utilization of existing inventions and systems in unconventional ways. Modern industry, as the greatest family of innovators in our history, could be very useful in assuming initiatives in these areas.

As we look ahead a few years, there are positive trends of tactics and associated hardware, support, command and control, and management systems which, when taken together, will determine the size and shape of the Army of the 1970s. The ever rising cost of national defense compels us to consider manpower conservation as a principal element in the cost equation. Postwar domestic and international demands can be expected to put further pressures on the defense budget.

Industry must keep abreast of all of the elements of change, and the Army will do well to develop cooperative measures to capitalize on industry's innovative capability to help it come out on top.

How Big Is a Small Business?

Clyde Bothmer

[Editor's Note: This is the sixth and last article in a series contributed to the *Defense Industry Bulletin* by Clyde Bothmer, Deputy Associate Administrator, Small Business Administration.]

The broad scope of industries which are eligible for programs of the Small Business Administration (SBA) is not widely known. The public tends to associate SBA with small retail establishments or manufacturing operations with basically simple requirements. Because of these misconceptions, members of the public are sometimes surprised at how sophisticated some small businesses are. In point of fact, there are a number of highly capable small firms making significant contributions to the defense industry and to the other sectors of the economy.

These firms are not small in technical capability or knowledge nor, perhaps, by the standards which the average citizen would apply, even by number of employees. The law, however, recognizes that in business the question of size is a relative one. Size standards are established in the environment of the business world, the market place; and similarly, those standards are a part of the frame of reference for every business, regardless of size.

The Small Business Act, as amended, provides that a small business concern is "one which is independently owned and operated and which is not dominant in its field of operation." In addition to this general statutory definition, the Administrator of the Small Business Administration is authorized to make a detailed definition of small business. Where the number of employees is used as one of the criteria in making a detailed definition, the number varies from industry to industry to the extent necessary to reflect differing characteristics of such industries and to take a proper account of other relevant factors.

The definition of small business also varies depending on the assistance program under consideration. There are different standards for the business loan programs, government procurement assistance, and the small business investment company program. The size standards for government procurement assistance tend to be higher than for the business loan program, because government requirements and specifications are frequently more sophisticated or exacting than for comparable commercial items. It is, therefore, necessary to adjust the standards in recognition of the situation.

Size Standards

Staff work on size standards for all the various programs is performed in the Size Standards Staff under the Associate Administrator for Procurement and Management Assistance. The specific, applicable definitions are published in the Small Business Size Standards Regulation, available from Regional Offices of SBA (for listing of Regional Offices, see article "Subcontracting and Small Business," *Defense Industry Bulletin,* July 1968, page 4.)

Any consideration of size standards begins with the aforementioned established regulation which divides business into general, industry classifications and, specifically, addresses divisions of those classifications. For purposes of government procurement, for example, the classifications are: construction; manufacturing; nonmanufacturing (those proposing to sell items which they do not themselves produce); research, development and testing; transportation; and refined petroleum products. Within each of these areas specific standards are established. Under manufacturing, for instance, a lengthy schedule sets forth a list of industries, according to the Standard Industrial Classification Manual published by the Bureau of the Budget, with the maximum number which may be employed if a firm is to be considered a small business. Other provisions handle certain exceptions. The standard for manufacture of passenger cars, for example, has the effect of making all automobile manufacturers small businesses, except the traditional "big three," *if* they are bidding on a contract for passenger cars within Census Classification Code 37171. In this industry the three largest producers have 97 percent of the market for passenger cars produced in the United States.

Interpretation of the statutory definition of small business depends upon the meanings established by SBA for the phrase, "not dominant in its field of operations," and the term "affiliate." The significance of the first, a direct quote from the Act, is obvious and the official meaning quickly stated: a firm is "not dominant in its field of operations" when it does not exercise a controlling or major influence, on a national basis in a kind of business activity in which a number of business concerns are primarily engaged. Consideration is given to all appropriate factors, such as volume of business, number of employees, competitive status of position, nature of business, etc.

The meaning of "affiliate" is important for two reasons: first, and more significant, the question of independent ownership and operation is determined here; second, all affiliates of a firm are considered together when the size criteria, such as employee numbers, are applied. Firms are affiliates of each other when, either directly or indirectly, one concern controls or has the power to control the other; or a third party or parties controls or has the power to control both. Consideration is given to factors such as common ownership, common management, and contractual relationships. For example, the president of one small firm, who owned a large block of stock in a second small business, might create an "affiliation" through his office and ownership. If, however, the two firms together did not exceed the size standard, there would be no problem in either business qualifying as a small business.

The Process of Modifying Size Standards

Within this framework the size standards are subject to modification as appropriate. Current data on the economy and on the various industries is continually evaluated for significance to the standards, and revisions are developed as necessary. Other changes begin with a request to SBA from another governmental agency or an industry/trade association that a particular standard be reviewed. As a general rule the request is directed toward an increase in the maximum size of a small business under the regulation. Although there is nothing wrong with such a suggestion, *per se*, the staff reviewing the request must balance the specific proposal against the undeniable fact that the position of small business would be nominally excellent, and actually abominable, if the standards were simply revised to qualify everyone. A statistical victory would scarcely be in the spirit of the Congressional intent, so the changes must be weighed carefully.

To review a prospective change, the Size Standards Staff obtains current and historical data on the size and composition of the industry concerned; government procurements and set-asides within this classification are evaluated; and past bidder's information is considered. If after this examination it appears that there is a reasonable case to be made for the proposed change, the Administrator authorizes announcment of the suggested modification in the Federal Register. Interested parties usually are given 15 to 30 days to make comments on the proposal. Occasionally, when data available to SBA are not considered adequate or appropriate, or if the subject matter requires a more intensive review, a hearing will be held at which oral testimony on the subject is received in addition to documentary presentations.

After comments are returned, the Size Standards Staff reviews the case once again, this time weighing information provided by members of the industry and other concerned parties. After this evaluation the case is presented to the Administrator with the staff recommendation for action. The final decision—whether to refuse or accept the original proposal, or perhaps to make a change not originally proposed—is made by the Administrator. The decision is then announced in the Federal Register and incorporated into the Size Standard Regulations.

Although SBA establishes the standards and makes the final determination of whether a firm qualifies as a small business, it is the contracting officer who is responsible for one of the most critical decisions on a given procurement, as far as small firms are concerned. The contracting officer, subject to the right of appeal, makes the determination of which industry classification and, therefore, which size standard applies to firms interested in the procurement. It is not unusual for an item to be classified under two areas. The classification is significant principally in set-asides. A set-aside, as discussed in a previous article of this series (see article, "Prime Contracting Program of Small Business Administration," *Defense Industry Bulletin*, August 1968, page 18), is the reservation of a portion of a procurement, or an entire procurement, for competition by small businesses.

Once the classification is made and a set-aside determined, the regular procurement procedure follows. Bidders certify that they are small businesses when bids are submitted. Should there be some doubt as to a bidder's qualification, any other bidder may register a protest with the contracting officer, who will forward the protest to the SBA Regional Office serving the area where the principal office of the protested firm is located. Similarly, the contracting officer may himself file such a protest. The Regional Office will then acknowledge the protest to both contracting officer and protesting firm, and will request the protested firm to provide information regarding its business and size as well as a response to the specific allegations of the protest. The answer must be returned within three days of receipt of the request or the protested concern will be ruled "other than a small business." After the response is provided, SBA determines the small business status of the protested concern and notifies the concerned parties of the result within 10 working days.

Who May Appeal Small Business Status?

The process described herein is one of three which may lead to review by the Size Appeals Board in SBA's Central Office. An appeal may be taken by any concern or other interested party which has:

- Protested the small business status of another concern as described herein, and whose protest has been denied by a Regional Director.
- Been adversely affected by a decision of a field office.
- Been adversely affected by a decision of a contracting officer regarding product classification.

Appeals are addressed to the Chairman, Size Appeals Board, Small Business Administration, Washington, D.C. 20416. No particular form of protest is established, but the appelformation pertinent to the circumlant is expected to include any instances of the appealed situation and a concise statement of his argument, along with documentary evidence supporting his contentions. The board informs interested parties, providing copies of the notice of appeal. Those parties then have five working days to submit a statement of their position on the appeal. The board, composed of the Deputy Administrator, the Associate Administrators for Procurement and Management Assistance and for Financial Assistance, and the Assistant Administrator for Planning, Research and Analysis, gives

(*Continued inside back cover*)

Top 100 Defense Contractors Announced

Top 100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards Fiscal Year 1968 (July 1, 1967—June 30, 1968)

The 100 companies, which together with their subsidiaries, were awarded the largest dollar volume of military prime contracts of $10,000 or more in FY 1968, accounted for $26.2 billion, or 1.9 percent more than in FY 1967. The total awarded to all U.S. companies was $38.8 billion, which was 1 percent less than in FY 1967.

Although the total volume of awards was almost the same in both fiscal years, there were sizeable increases in the procurement of ammunition, missiles and space equipment, petroleum, and transportation services. Awards decreased in clothing and textiles, construction, and miscellaneous commercial type items. In general, the industries affected by the increased defense procurement are more highly concentrated than those affected by decreased procurement. It is principally for this reason that the top 100 companies received 1.9 percent more of the FY 1968 than of the FY 1967 total, or 67.4 percent compared with 65.5 percent.

Listing of the top 100 companies and their subsidiaries, in order of rank, is given below. The report is compiled by the Directorate for Statistical Services in the Office of the Assistant Secretary of Defense (Comptroller), Washington, D. C. 20301.

Rank	COMPANY	THOUSANDS OF DOLLARS
	U. S. TOTAL [a]	$38,826,625
	Total, 100 Companies & Their Subsidiaries [b]	26,171,192
1.	General Dynamics Corp	2,231,488
	Dynatronics Inc	27
	Stromberg Carlson Corp	7,782
	United Electric Coal Co	42
	TOTAL	2,239,339
2.	Lockheed Aircraft Corp	1,858,363
	Lockheed Shipbuilding Construction	11,834
	TOTAL	1,870,197
3.	General Electric Co	1,485,096
	General Electric Supply Co	3,611
	TOTAL	1,488,707
4.	United Aircraft Corp	1,320,991
5.	McDonnell Douglas Corp	1,087,660
	Conductron Corp	5,372
	Hycon Mfg Co	7,805
	TOTAL	1,100,837
6.	American Telephone & Telegraph Co	161,405
	Chesapeake & Potomac Telephone Co	13,018
	Illinois Bell Tel Co	38
	Mountain States Tel & Tel Co	1,872
	New England Tel & Tel Co	549
	New Jersey Bell Telephone Co	529
	New York Telephone Co	152
	Northwestern Bell Telephone Co	235
	Ohio Bell Telephone Co	601
	Pacific Northwest Bell Telephone	160
	Pacific Telephone & Telegraph Co	225
	Southern Bell Telephone & Telegraph	2,178
	Southwestern Bell Telephone	1,197
	Teletype Corp	22,591
	Western Electric Co Inc	571,177
	TOTAL	775,927
7.	Boeing Co	762,141
8.	Ling Temco Vought Inc	50,011
	Altec Service Co	58
	Braniff Airways Inc	46,304
	Continental Electronics Mfg Co	4,238
	Jefferson Wire & Cable Corp	151
	Jones & Laughlin Steel Corp	695
	Kentron Hawai Ltd	8,549
	L T V Electrosystems	123,592
	L T V Aerospace Corp	487,762
	L T V Ling Altec Inc	886
	Memcor Inc	25,883
	National Car Rental System	11
	Okonite Co The	1,656
	Wilson & Co Inc	8,299
	Wilson Pharmaceutical & Chem Corp	16
	Wilson Sporting Goods Co	150
	TOTAL	758,261
9.	North American Rockwell Corp	668,482
	Remmert-Werner, Inc	159
	TOTAL	668,641
10.	General Motors Corp	629,515
	Frigidaire Sales Corp	95
	TOTAL	629,610
11.	Grumman Aircraft Engineering Corp	629,197
12.	Avco Corp	583,648
13.	Textron Inc	18,438
	Accessory Products Co	133
	Bell Aerospace Corp	478,691
	Bell Aerosystems Co	100
	Bostitch Inc	14
	Camcar Screw & Mfg Co	80
	Fafnir Bearing Co	1,501
	Fanner Mfg Co	66
	Talon, Inc	332
	Textron Electronics Inc	993
	Townsend Co	297
	Waterbury Farrel	102
	TOTAL	500,747
14.	Litton Industries, Inc	28,752
	Aero Service Corp	822
	Allis (Louis) Co	1,318
	Alvey Ferguson Co	130
	Clifton Precision Products Co	27
	Eureka X-ray Tube Corp	33
	Ingalls Shipbuilding Corp	277,289
	Kimball Systems, Inc	22
	Litton Precision Prods Inc	6,829
	Litton Systems Inc	150,386
	Monroe International Inc	43
	Profexray Inc	27
	Royal Typewriter Co, Inc	13
	TOTAL	465,691
15.	Raytheon Co	431,241
	Amana Refrigeration Inc	18
	Machlett Laboratories Inc	19,350
	Micro State Electronics Corp	125
	Raytheon Education Co	926
	Seismograph Service Corp	94
	TOTAL	451,754
16.	Sperry Rand Corp	447,197
17.	Martin Marietta Corp	357,642
	Amphenol-Borg Electronics, GMBH	286
	Bunker Ramo Corp	35,526
	TOTAL	393,454
18.	Kaiser Industries Corp	97
	Kaiser Aerospace & Electronics Co	5,615
	Kaiser Jeep Corp	295,803
	Kaiser Steel Corp	52,836
	National Steel & Shipbuilding Co	31,983
	TOTAL	386,334
19.	Ford Motor Co	76,771
	General Micro-Electronics, Inc	170
	Philco Ford Corp	304,403
	TOTAL	381,344
20.	Honeywell Inc	351,625
	Computer Control Co Inc	57
	TOTAL	351,682
21.	Olin Mathieson Chemical Corp	329,415
22.	Northrop Corp	182,150
	Hallicrafters Co	33,467
	Northrop Carolina Inc	26,183
	Page Communications Engineers Inc	67,934
	Secoa, Inc	493
	Warnecke Electron Tubes, Inc	29
	TOTAL	310,256

No.	Company	Amount
23.	Ryan Aeronautical Co	133,751
	Continental Aviation & Engr Corp	39,142
	Continental Motors Corp	111,891
	Wisconsin Motor Corp	8,374
	TOTAL	293,158
24.	Hughes Aircraft Co	285,858
	MEVA Corp	251
	TOTAL	286,109
25.	Standard Oil of New Jersey	148
	American Cryogenics Inc	251
	Enjay Chemical Co	93
	Esso AG	1,310
	Esso International Corp	144,905
	Esso Petrol Co Ltd	92
	Esso Research & Engineering Co	1,164
	Esso Standard Eastern Inc	340
	Esso Standard Italiana	2,035
	Esso Standard Oil Co SA	2,584
	Esso Standard SAF	119
	Esso Standard Thailand Ltd	124
	Humble Oil & Refining Co	121,212
	TOTAL	274,377
26.	Radio Corp of America	254,961
	RCA Defense Electronics Corp	39
	RCA Institutes Inc	12
	TOTAL	255,012
27.	Westinghouse Electric Corp	247,664
	Thermo King Corp	1,466
	Thermo King Sales & Service	66
	Westinghouse Electric Supply Co	1,319
	Westinghouse Learning Corp	524
	TOTAL	251,039
28.	General Tire & Rubber Co	11,636
	Aerojet Delft Corp	979
	Aerojet General Corp	210,232
	Batesville Mfg Co	24,182
	Fleetwood Corp	10
	Frontier Airlines Inc	21
	General Tire International Co	996
	TOTAL	248,056
29.	International Telephone & Tel Corp	135,713
	Amplex Corp	67
	Barton Instrument Corp	37
	Consolidated Electric Lamp Co	11
	Continental Baking Co	2,194
	Federal Electric Corp	65,499
	ITT Electro Physics Laboratories	2,715
	ITT Gilfillan Inc	34,809
	ITT Technical Services Inc	521
	TOTAL	241,566
30.	International Business Machine Co	223,023
	Science Research Associates Inc	199
	Service Bureau Corp	439
	TOTAL	223,661
31.	Bendix Corp	214,398
	Bendix Field Engineering Corp	7,426
	Bendix Westinghouse Auto-Motive	175
	Dage Electric Co Inc	13
	Fram Corp	1,017
	Mosaic Fabrications Inc	195
	P & D Mfg Co Inc	331
	TOTAL	223,555
32.	Pan American World Airways Inc	205,652
33.	F M C Corp	175,860
	Gunderson Bros Engineering Corp	9,406
	TOTAL	185,266
34.	Newport News Shipbld & Dry Dck Co	181,248
	Nuclear Service & Constr Co, Inc	61
	TOTAL	181,309
35	Raymond Morrison Knudsen (JV)	176,000
36.	Signal Companies Inc (The)	
	Dunham Bush Inc	465
	Garrett Corp	114,620
	Mack Trucks, Inc	48,407
	Signal Oil & Gas Co	5,792
	Southland Oil Corp	2,287
	TOTAL	171,571
37.	Hercules Inc	170,242
	Haveg Industries Inc	1,119
	TOTAL	171,361
38.	Dupont E I De Nemours & Co	30,662
	Remington Arms Co	139,907
	TOTAL	170,569
39.	Texas Instruments Inc	169,271
40.	Day & Zimmerman Inc	166,240
41.	General Telephone & Electn Corp	93
	Automatic Electric Co	9,682
	Automatic Electric Sales Corp	1,829
	General Telephone & Electronic Lab	273
	General Telephone Co of Southeast	151
	Hawaiian Telephone Co	4,626
	Lenkurt Electric Co Inc	8,650
	Sylvania Electric Products Inc	133,706
	TOTAL	159,010
42.	Uniroyal Inc	154,163
	Uniroyal International Corp	136
	TOTAL	154,299
43.	Chrysler Corp	146,586
	Factory Motor Parts Co	14
	TOTAL	146,600
44.	Standard Oil Co of Calif	71,462
	Caltex Asia Ltd [c]	1,853
	Caltex Oil Products Co [c]	61,766
	Caltex Oil Thailand Ltd [c]	1,995
	Caltex Overseas Ltd [c]	379
	Caltex Philippines Inc [c]	436
	Chevron Asphalt Co	50
	Chevron Chemical Co	797
	Chevron Oil Co	2,153
	Chevron Oil Co of Venezuela	1,610
	Chevron Shipping Co	1,297
	Standard Oil Co Kentucky	2,297
	Standard Oil Co Texas	122
	TOTAL	146,217
45.	Norris Industries	139,064
	Fyr Fyter Co	202
	TOTAL	139,266
46.	Texaco Inc	45,404
	Caltex Asia Ltd [c]	1,853
	Caltex Oil Products Co [c]	61,766
	Caltex Oil Thailand Ltd [c]	1,995
	Caltex Overseas Ltd [c]	379
	Caltex Philippines Inc [c]	436
	Jefferson Chemical Co Inc	105
	Texaco Antilles, Ltd	88
	Texaco Export Inc	22,561
	Texaco Puerto Rico Inc	2,451
	White Fuel Co Inc	984
	TOTAL	138,022
47.	Collins Radio Co	134,754
48.	Goodyear Tire & Rubber Co	55,358
	Goodyear Aerospace Corp	76,201
	Motor Wheel Corp	2,046
	TOTAL	133,605
49.	Asiatic Petroleum Corp	132,796
50.	Sanders Associates Inc	130,830
	Mithras Inc	481
	TOTAL	131,311
51.	Mobil Oil Corp	128,065
52.	T R W Inc	126,363
	Globe Industries Inc	348
	International Controls Corp	672
	Ramsey Corp	14
	United-Carr, Inc	70
	TOTAL	127,467
53.	Mason & Hanger Silas Mason Co	127,064
54.	Massachusetts Institute of Technology (N)	124,143
55.	Magnavox Co	123,100
56.	Fairchild Hiller Corp	121,165
	Burns Aero Seat Co Inc	94
	TOTAL	121,259
57.	Pacific Architects & Engineers Inc	120,895
58.	Thiokol Chemical Corp	119,363
59.	Eastman Kodak Co	117,566
	Eastman Chemical Products Corp	51
	Eastman Kodak Stores Inc	706
	TOTAL	118,323
60.	United States Steel Corp	108,322
	Reactive Metals Inc	161
	US Steel International, Inc	7,679
	TOTAL	116,162
61.	American Machine & Foundry Co	108,871
	Cundo Engineering Corp	1,052
	TOTAL	109,923
62.	Chamberlain Corp	104,441
63.	General Precision Equipment Corp	
	American Meter Controls Inc	29
	Controls Co of America	377
	General Precision Decca Systems	90
	General Precision Systems Inc	86,361
	Graflex Inc	1,571
	Industrial Timer Corp	15
	National Theatre Supply	16
	Strong Electric Corp	3,605
	Tele-Signal Corp	9,686
	Vapor Corp	2,194
	TOTAL	103,944
64.	Lear Siegler Inc	74,000
	American Avitron	43
	L S I Service Corp	27,526
	Transport Dynamics Inc	685
	Verd A Ray Corp	18
	TOTAL	102,272
65.	Harvey Aluminum Inc	25,048
	Harvey Aluminum Sales	74,045
	TOTAL	99,093
66.	National Presto Industries Inc	96,886
67.	Teledyne Inc	77,173
	ADCOM Inc	309
	Amelco, Inc	4,146
	Continental Device Corp	27
	Crystalonics Inc	13
	Electro Development Co	50
	Geotechnical Corp	25
	Getz William Corp	128
	Gill Electric Mfg Corp	517
	Hydra Power Corp	1,017
	Irby Steel Co	59
	Isotopes Inc	802
	Landis Machine Co	22
	Micronetics Inc	346
	Microwave Electronics Corp	30
	Milliken D B Co Inc	1,024
	National Geophysical Co Inc	92
	Ordnance Specialties Inc	24
	Packard Bell Electronics Corp	6,504
	Penn Union Electric Corp	11

	Teledyne Inc (cont'd)	
	Pines Engineering Co, Inc	158
	Rodney Metals, Inc	11
	Wah Chang Corp	26
	TOTAL	92,514
68.	City Investing Co	
	American Electric Co	35,966
	Hayes Holding Co	49,002
	Rheem Mfg Co	1,857
	Wilson Shipyard, Inc	164
	TOTAL	86,989
69.	Colt Industries, Inc	2,258
	Chandler Evans, Inc	10,087
	Colts Inc	68,989
	Elox Corp	194
	Fairbanks Morse, Inc	4,582
	Pratt & Whitney Inc	436
	TOTAL	86,546
70.	Western Union Telegraph Co	79,299
71.	American Mfg Co of Texas	76,552
72.	Curtiss Wright Corp	74,799
	Comet Tool & Die Co	350
	Zarkin Machine Co	275
	TOTAL	75,424
73.	White Motor Co	15,976
	Hercules Engines Inc	58,610
	Minneapolis Moline Inc	394
	TOTAL	74,980
74.	Aerospace Corp (N)	73,541
75.	Cessna Aircraft Co	71,834
	Aircraft Radio Corp	1,076
	TOTAL	72,910
76.	Emerson Electric Co	63,776
	Pace Inc	68
	Rantec Corp	31
	Ridge Tool Co	26
	Supreme Products Corp	8,807
	Wiegand (Edwin L) Co	134
	TOTAL	72,842
77.	Seatrain Lines Inc	42,039
	Commodity Chartering Corp	1,667
	Hudson Waterways Corp	22,547
	Transeastern Shipping Corp	4,348
	TOTAL	70,601
	Gulf Oil Corp	66,934
	Goodrich Gulf Chemicals Inc	81
	Gulf Oil Trading Co	259
	Pittsburg Midway Coal Mining Co	104
	TOTAL	67,378
79.	Condec Corp	65,162
	Consolidated Controls Corp	1,587
	N J E Corp	155
	TOTAL	66,904
80.	Motorola Inc	65,715
	Motorola Overseas Corp	218
	TOTAL	65,933
81.	Continental Air Lines Inc	64,523
82.	Federal Cartridge Corp	64,519
83.	Hughes Tool Co	62,533
84.	Vitro Corp of America	59,674
	Vitro Minerals Corp	1,471
	TOTAL	61,145
85.	Johns Hopkins University (N)	57,674
86.	Control Data Corp	50,225
	Associated Aero Science Labs Inc	1,891
	C E I R Inc	852
	Control Corp	142
	Electronic Accounting Card Corp	723
	Pacific Technical Analysts, Inc	1,705
	T R G Inc	1,264
	TOTAL	56,802
87.	Lykes Corp	55,247
	Gulf & South American Steamship Co	683
	TOTAL	55,930
88.	McLean Industries, Inc	
	Equipment Inc	5,902
	Gulf Puerto Rico Lines, Inc	259
	Sea-Land Service, Inc	49,751
	TOTAL	55,912
89.	Aerodex Inc	55,345
90.	Susquehanna Corp	2,415
	Atlantic Research Corp	51,452
	Xebec Corp	886
	TOTAL	54,753
91.	Sverdrup & Parcel & Assocs Inc	1,396
	Aro Inc	53,165
	TOTAL	54,561
92.	States Marine Lines Inc	54,015
93.	Hazeltine Corporation	53,781
94.	Atlas Chemical Industries Inc	53,574
95.	Vinnell Corp	51,609
96.	Harris-Intertype Corp	913
	Gates Radio Co	796
	PRD Electronics, Inc	20,613
	Radiation, Inc	29,156
	TOTAL	51,478
97.	World Airways Inc	51,358
98.	International Harvester Co	51,271
99.	Automatic Sprinkler Corp America	50,395
	Badger Fire Extinguisher Co	38
	TOTAL	50,433
100.	Smith Investment Co	
	Smith A O Corp	40,323
	Smith A O of Texas	9,998
	TOTAL	50,321

FOOTNOTES:

[a] Net value of new procurement actions minus cancellations, terminations, and other credit transactions. The data include debit and credit procurement actions of $10,000 or more, under military supply, service and construction contracts for work in the United States, plus awards to listed companies and other U.S. companies for work overseas.

Procurement actions include definitive contracts, the obligated portions of letter contracts, purchase orders, job orders, task orders, delivery orders, and any other orders against existing contracts. The data do not include that part of indefinite quantity contracts that have not been translated into specific orders on business firms, nor do they include purchase commitments or pending cancellations that have not yet become mutually binding agreements between the Government and the company.

[b] The assignment of subsidiaries to parent companies is based on stock ownership of 50 percent or more by the parent company, as indicated by data published in standard industrial reference sources. The company totals do not include contracts made by other U.S. Government agencies and financed with Defense Department funds, or contracts awarded in foreign nations through their respective governments. The company names and corporate structures are those in effect as of June 30, 1968, and for purposes of this report company names have been retained unless specific knowledge was available that a company had been merged into the parent or absorbed as a division with loss of company identity. Only those subsidiaries are shown for which procurement actions have been reported.

[c] Stock ownership is equally divided between Standard Oil Co. of California and Texaco, Inc; half of the total of military awards is shown under each of the parent companies.

(N)—Non-profit.

(JV)—Joint venture of Raymond International, Inc.; Morrison-Knudsen Co.; Brown & Root, Inc.; and J. A. Jones Construction Co.

Army Extends Vertical Management to More Equipment Categories

Modern concepts for vertical management of weapon systems are being extended to additional categories of equipment at the Army Missile Command, Redstone Arsenal, Ala., with establishment of two product management offices and two new commodity offices.

Items designated for product management are Target Missiles and the Land Combat Support System (LCSS). Product management offices are also being planned for the Air Defense Control and Coordination System and Multiple Artillery Rocket System.

New commodity offices established at the Missile Command are for Aircraft Weapons and for Land Combat Weapons.

Colonel Robert W. Van Wert has been named acting Product Manager for Target Missiles pending arrival of the designated product manager, Lieutenant Colonel William L. Rehm.

New Product Manager for LCSS is Lieutenant Colonel Frank A. Matthews. He is being transferred to the new post from duty as head of the System Support Division of the Pershing Project Manager's Office.

William Rotenberry has been selected as Acting Chief of the Aircraft Weapons Commodity Office, and Herman Martin will serve as Acting Chief of the Land Combat Weapons Commodity Office.

The Aircraft Weapons Commodity Office will manage the application of TOW missiles on the new Cheyenne helicopter, and airborne rocket launchers.

The Land Combat Weapons Commodity Office covers management of the Honest John and Littlejohn rockets, ENTAC and the LAW training device.

MEETINGS AND SYMPOSIA

JANUARY

Aerospace Sciences Meeting, Jan. 20–22, at Statler Hilton Hotel, New York, N.Y. Sponsor: American Institute of Aeronautics and Astronautics. Contact: American Institute of Aeronautics and Astronautics, 1290 Sixth Ave., New York, N.Y. 10019.

Fundamental Interactions at High Energy Conference, Jan, 22–24, at University of Miami, Coral Gables, Fla. Sponsor: Air Force Office of Scientific Research. Contact: Capt. D. R. Lehman, Air Force Office of Scientific Research (SRPN), 1400 Wilson Blvd., Arlington, Va. 22209, Phone: (202) 694–5581.

System Sciences Conference, Jan. 22–24, at University of Hawaii, Honolulu, Hawaii. Sponsors: Air Force Office of Scientific Research, Army Research Office, Office of Naval Research, National Science Foundation, and the University of Hawaii. Contact: Capt. A.D. Dayton, Air Force Office of Scientific Research (SRMA), 1400 Wilson Blvd., Arlington, Va. 22209, Phone: (202) 694–5261.

International Symposium on Information Theory, Jan. 28–31, at Ellenville, N.Y. Co-sponsors: Air Force Office of Scientific Research and Institute of Electrical and Electronic Engineers. Contact: Maj. P.J. Daily, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone: (202) 694–5261.

FEBRUARY

Second Air Force Metalworking Technology Conference, Feb. 24–27, at Hotel Sahara, Las Vegas, Nev. Sponsor: Metallurgical Processing Branch of Air Force Materials Laboratory, Wright-Patterson AFB, Ohio. Contact: Air Force Metalworking Technology Conference, Universal Technology Corp., 1388 Research Park Drive, Dayton, Ohio 45432.

MARCH

Airbreathing Propulsion for Advanced Missile and Aircraft Symposium, March 4–6, at Naval Training Center, San Diego, Calif. Security classification: SECRET. Sponsors: Air Force Aero Propulsion Laboratory, Air Force Rocket Propulsion Laboratory, and Naval Weapons Center. Contact: Leonard Dickey, Air Force Aero Propulsion Laboratory (APR), Wright-Patterson AFB, Ohio 45433, Phone (513) 255–5221.

APRIL

International Symposium on Global Problems in Analysis, April 2–4, at Princeton University, Princeton, N.J. Sponsor: Air Force Office of Scientific Research. Contact: Dr. R.G. Pohrer, Air Force Office of Scientific Research (SRMM), 1400 Wilson Blvd, Arlington, Va. 22209, Phone: (202) 694–5264.

Army Numerical Analysis Conference, April 24–25, at Walter Reed Army Institute of Research, Washington, D.C. Sponsor: U.S. Army Research Office—Durham. Contact: Dr. Francis G. Dressel, Mathematics Div., U.S. Army Research Office—Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone: (919) 286–2285.

MAY

Frequency Control Annual Symposium, May 6-8, at Atlantic City, N.J. Sponsor: Solid State and Frequency Control Div., Electronics Components Laboratory, U.S. Army Electronics Command. Contact: M.F. Timm, Electronic Components Laboratory, U.S. Army Electronics Comand, Fort Monmouth, N.J. 07703, Phone: (201) 535–2250.

Annual Conference on Power Sources, May 20–22, at Shelburne Hotel, Atlantic City, N.J. Sponsors: U.S. Army Electronics Command and Interagency Advanced Power Group. Contact: Galen R. Frysinger (AMSEL–KL–P), U.S. Army Electronics Command, Fort Monmouth, N.J. 07703.

Anopheline Biology and Malaria Eradication Conference, May 21–23, 23, at Washington, D.C. Sponsors: Armed Forces Pest Control Board and the Forest Glen Section of the Walter Reed Army Medical Center. Contact: Lt. Col. John E. Scanlon, Chief, Department of Entomology, Division of Communicable Diseases and Immunization, Walter Reed Army Institute of Research, Washington, D.C. 20315, Phone: (202) 576–3719.

JUNE

Shock Tube International Symposium, June 23–25, at University of Toronto, Canada. Sponsor: Air Force Office of Scientific Research. Contact: M. Rogers, Air Force Office of Scientific Research (SREM), 1400 Wilson Blvd., Arlington, Va. 22209, Phone: (202) 694–5568.

New AFSC Unit To Support Bare Base Concept

Air Force Systems Command (AFSC) has activiated a new management organization called the Air Mobility Division to support the continuing and expanding bare base concept.

The new Air Mobility Division assumes the functions of the former Bare Base Office and operates under jurisdiction of Aeronautical Systems Division's Deputy for Limited War at Wright-Patterson AFB, Ohio.

The bare base concept envisions the development of highly mobile facilities, which can be flown to an advanced site and erected immediately to provide the essential elements for a suitable operational base.

The Air Mobility Division was established to develop equipment which will improve the capability of Air Force operational and support forces to rapidly deploy to, and operate from, bare base sites anywhere in the world. Colonel Gerald K. Hendricks heads the new division.

2,000 New Family Housing Units Set for FY 1969

The Defense Department has announced a $40 million housing construction program for FY 1969 which calls for the production of 2,000 military family housing units to be located in 12 states.

The Army will get 500 units, 750 will be constructed at Navy installations, and 750 at Air Force sites.

Following is a breakdown of building sites and number of units to be constructed:

Marine Corps Air Station, Yuma, Ariz. 100
George AFB, Calif. 200
Fort Gordon, Ga. 200
Naval Complex, Oahu, Hawaii 150
Pacific Missile Range Facilities, Kauai, Hawaii 56
Mountain Home AFB, Idaho 250
Fort Levenworth, Kan. 100
Naval Air Test Center, Patuxent River, Md. 100
Naval Auxiliary Air Station, Fallon, Nev. 44
Holloman AFB, N.M. 300
Naval Complex, Newport, R.I. 100
Fort Hood, Tex. 200
Naval Auxiliary Air Station, Chase Field, Tex. 100
Naval Air Station, Whidbey Island, Oak Harbor, Wash. 100

Airborne Warning Office Reorganized

An organizational change involving the 411L Airborne Warning and Control (AWACS) System Program Office (SPO) has been announced by the Air Force Systems Command's Electronic Systems Div., at L. G. Honscom Field, Mass.

The System Program Director, Colonel Kendall Russell, will now report directly to Electronic Systems Division commander. Before the organizational change, the SPO was a subdivision of the Deputy for Surveillance and Control Systems.

The AWAC System will provide the Air Force with a quick reaction airborne command and control system for global deployment as well as a survivable warning and control capability for the air defense of the Continental United States.

Military Services Join in Test Effort To Meet Tactical Communications Needs

The U.S. Army, Navy and Air Force have begun the second phase of a joint test effort to determine the feasibility of using ultra-high frequency (UHF) communication satellites to meet the expanding communication needs of U.S. tactical armed forces.

Initial tests have been accomplished using a limited number of terminals located throughout the United States with the recently launched Lincoln Experimental Satellite (LES–6), now in a synchronous parking orbit about 22,000 statute miles above the equator. The first phase of this joint Service experiment was accomplished with LES–5, the predecessor of LES–6.

The Air Force System Command's Electronic Systems Division (ESD), L. G. Hanscom Field, Mass., is responsible for the coordination and conduct of the joint Service LES–6 test effort.

In this joint endeavor, ESD is also procuring additional UHF terminals suitable for deployment in aircraft ships, submarines, helicopters and mobile ground vehicles of the Military Services for the Tactical Satellite Communications Operational Feasibility Test Program to be tested with LES–6 later in the test program.

Colonel Harley L. Grimm, director of the Tactical Satellite Communications Program at ESD stated that, "Various objectives will be reached by this testing including the actual performance of the equipment, the feasibility of reliable satellite communications between geographically separate forces in operational environments, the existence of electromagnetic compatibility, and a study of the basic characteristics of the system.

He further stated, "The testing along with the resultant data collected and evaluated will provide a base for the development of the Tactical Satellite Communications System. In addition, it will provide a trained cadre of Air Force, Army, Navy and Marine Corps personnel familiar with the complex ultra-high frequency terminal equipment, the traffic handling procedures, and operating characteristics representative of the final system."

The organizations participating in the joint Service test of LES–6 are Lincoln Laboratory, Lexington, Mass.; Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio; Rome Air Development Center, Griffiss AFB, N.Y.; Naval Electronics Laboratory, San Diego, Calif.; Naval Air Development Center, Johnsville, Pa.; Navy Underwater Sound Laboratory, New London, Conn.; Naval Electronics Systems, Test and Evaluation Facility, Webster Field, Md.; the Army Satellite Communications Agency, Fort Monmouth, N.J.; and the U.S. Coast Guard. As the program progresses, additional organizations including operational units will participate in testing with LES–6.

The agencies responsible for conducting this joint test program within each Service are: the Army Satellite Communications Agency, Fort Monmouth, N.J.; the Naval Electronics Systems Command, Washington, D.C.; and the Air Force Electronic Systems Division, L. G. Hanscom Field, Mass.

Major Henry Zinke of the ESD Tactical and Survivable Communications Systems Program Office is the joint Service project officer coordinating the test.

AFLC Guidance Unit Redesignated

The Air Force Logistics Command has established the Aerospace Guidance and Metrology Center at Newark Air Force Station, Ohio, replacing the 2802nd Inertial Guidance and Calibration Group. The center is the single point in the Air Force for repair of inertial guidance systems for aircraft and missiles. It also maintains the Air Force measurement standards and directs the world-wide calibration program.

The name change is part of a general reorganization, grouping major activities into four directorates under the headings of maintenance, metrology, service engineering, and supply and support.

The center is commanded by Colonel Morris C. Burkhart.

ASPR Committee Case Listing

The following is a listing (revised as of Nov. 12, 1968) of the cases currently under consideration by the Armed Services Procurement Regulation (ASPR) Committee, of the Office of the Assistant Secretary of Defense (Installations and Logistics).

On items marked by asterisks, the text has been omitted to shorten the listing. The asterisks denote actions taken as shown below:

**—Case closed, no ASPR revision resulting.*

***—Case closed, approved for printing in a subsequent ASPR revision.*

****—Case closed, approved for printing subject to further government coordination.*

The listing includes subjects of interest to contractors but excludes cases of a minor or editorial nature, those considered "sensitive," and those involving a deviation from the regulation which are processed by the ASPR Committee.

The ASPR Committee meets with representatives of major industry associations periodically to explain the purpose and status of each of the cases under consideration, and to answer questions from industry representatives concerning the cases. All proposed ASPR changes of major policy are forwarded to industry associations in draft form for the review and comments of the association memberships. Industry comments are evaluated by the Defense Department before a final decision on the proposal is made by the ASPR Committee.

Rental Charges for Use of Government Property. To consider whether the adoption of a policy of charging rent for use of government property, across the board, would be more practical and less burdensome in assuring against competitive advantage and would result in a decline in the number of requests for use of government property generally. No definitive action has been taken on the numerous proposed solutions to this matter. This problem is still under consideration.

** **Industry Cost Sharing.**

Cost Principle—Depreciation. To review the depreciation guidelines and rules issued by new Revenue Procedures 65–13, and to prepare appropriate changes to ASPR 15–205.9 which may be necessary as a result of Revenue Procedures 65–13 issued by the Internal Revenue Service. After considering industry comments, revised coverage has been approved for printing in the 15–205.9 paragraph. However, printing of the .9 paragraph is being withheld until action to revise 15–205.32 covering "Gains and Losses on Disposition of Depreciable Property and Other Capital Assets" is complete. As a result of industry comments received on the .32 paragraph, the principle was changed to simplify both the language and the procedures for determining the gain or loss. Because of this change, the revised cost principle was again forwarded to industry for comment on May 31, 1968. These comments are under consideration.

Equal Employment Opportunity. To develop implementation of the Department of Labor revised rules with respect to the subject matter. ASPR implementation has been developed and forwarded to the Department of Labor for approval.

Review of the Implementation of Public Law 87–653. To undertake a review of the ASPR implementation of Public Law 87–653 on the basis of the experience thus far obtained, to determine the need for further guidance or clarification of such coverage. This review has been divided into five broad areas as follows:

(a) **The submission of data.** When is data submitted? Submission vs. disclosure or availability. Identification of data. Contracting Officer (and other) documentation.

(b) **Definitions of "current" and "complete."** From the standpoint of reasonableness and practicability. How should significance be considered?

(c) **Examination of Records.** Audit before negotiation. Audit after contract award. Audit of subcontractor data.

(d) **Subcontract Problems.** Subcontracts under firm fixed-price primes. Second and third tier subcontracts.

(e) **Significance.** From the standpoint of price negotiation vs. application of defective pricing clause. Price changes after price agreement but before contract award.

Proposed coverage on (a), (b), (c) and (e) was previously circulated to industry for comment, and the results of this effort were issued in Defense Procurement Circular No. 57, dated Nov. 30, 1967.

Proposed coverage on the subcontract aspect of this matter was forwarded to industry for comment on March 4, 1968, with a request that comments be presented by May 4, 1968. Pursuant to industry's request, the date for submission of comments was extended to July 7. Industry comments are being considered.

Cost Information Reports (CIR). Proposed ASPR coverage for Cost Information Reports (CIR) has been developed and was approved for print by the ASPR Committee. However, printing has been withheld based upon information that the basic DOD instruction is in the process of being changed and that the changes contemplated will require redrafting the ASPR coverage. Revision of the instruction is still in process.

Contract Modifications. To develop a new ASPR Section consolidating service material dealing with all types of contract modifications. Consideration of this subject is continuing.

Handbook for Procurement Quality Assurance. To prepare an ASPR Supplement which will provide standardized procedures, where possible, for use of government inspection and quality assurance personnel. The proposed coverage, providing internal guidance to inspection and quality assurance personnel, has been approved for printing, subject to ratification by higher authority.

** **Contractor Utilization of Industrial Production Equipment.**

** **Transportation.**

Communications Services. Development of uniform ASPR coverage which would permit deletion of existing departmental coverage with respect to procurement of communication services from both regulated and unregulated suppliers. Industry comments have been received, considered, and revised coverage developed. Final action on this coverage has been delayed awaiting review by high authority.

Advance Understandings of Allowability, ASPR 15-107. To revise the existing ASPR paragraph to explicitly provide that such agreements must be in writing to be binding on the Government. Proposed ASPR coverage concerning Advance Understandings on Particular Cost Items was forwarded to industry for comment on May 29, 1968. The comments received from industry and other government agencies have been reviewed. Final action on this case will be undertaken in the near future.

Compensation Review Procedures. To prepare procedures to be followed by government personnel to assure that compensation paid to contractor employees performing on government contracts is reasonable. The subcommittee report is being evaluated.

* **Training and Educational Costs, ASPR 15-205.44.**

Help Wanted Advertising, ASPR 15-205-33. To consider revising the cost principle to define the type of recruiting advertising that is allowable. Prior to undertaking a revision of the subject cost principle, the committee determined to seek industry assistance in an effort to obtain data which could be used in assessing the benefits of (i) institutional type advertising containing help wanted advertisements, in contrast with (ii) help wanted advertising in the classified section of the daily newspapers. A response from CODSIA providing data in this area was received on April 26. The proposed revision of the principle was forwarded to industry for comment on July 22. Industry and government agency comments have been received and are being considered.

Technical Data Warranty. To consider the advisability of incorporating in ASPR a warranty clause for technical data. Proposed ASPR coverage with respect to the subject matter was forwarded to industry for comment on May 17, 1968. Industry comments have been received and are under consideration.

** **Price Representation Clause.**

Predetermination of Rights in Data. To reconsider the predetermination policy and its application, and determine the practical utility of the procedures and whether the procedures should be revised. Proposed ASPR coverage on the subject matter was forwarded to industry for comment on March 14, 1968 with a request that comments be presented by May 14. On May 8, 1968, pursuant to industry's request, the date for submission of comments was extended to June 14. Industry comments have been received and considered. It is contemplated the final action will be taken on this matter in the near future.

Reporting of Labor Disputes. To consider revising the coverage contained in ASPR 12-101.3, "Reporting of Labor Disputes," and the ASPR clause in 7-104.4, "Notice to the Government of Labor Disputes," to clarify and simplify the reporting of labor disputes under the subject coverage. This case has been enlarged to revise and update all of Section XII, with the exception of Part 8 covering "Equal Employment Opportunity."

Modification of Weighted Guidelines to Give Greater Recognition to Invested Capital. To develop a revision to the present weighted guidelines coverage to give more recognition to contractor investment.

Purchase vs. Lease; Allowability of Costs Under ASPR 15-205.34 and 15-205.48 for ADPE, Other Equipment and Buildings. To clarify 15-205.34(b) in light of the General Accounting Office report alleging improper application; revision of 15-205.48 to provide that a "price" established pursuant to 15-205.22(e) may be used for the purpose of determining ownership costs of ADPE rented from an affiliate; modify 15-205.9 to insert a new paragraph (g) to clearly point out that depreciation cost basis of any equipment, including ADPE, may be at a "price" established pursuant to 15-205.22(e); modify 15-205.34 and .48 to specifically provide that "interest" and other nonallowable costs are to be excluded in comparing or limiting rental costs to those of ownership; and to clearly provide that "interest" is not an allowable cost. Proposed ASPR coverage with respect to the subject matter was forwarded to industry for comment on May 27, 1968. Industry comments have been received and are under consideration.

Revisions to ASPR 15-205, Cost Principles on Bid and Proposal and Independent Research and Development. The proposed revisions to the existing ASPR cost principles on Independent Research and Development and Bid and Proposals were developed as a staff action outside of the ASPR Committee and referred to the Committee for editing and the obtaining of industry comments. This material was forwarded to industry on Jan. 29, 1968. On March 25, 1968, the reporting date for submission of comments by Industry and government agencies was extended to June 30, 1968. Industry comments have been received and are under study.

** **Contractor Performance Evaluation (Development) Expansion.**

Revision to ASPR 15-205.41—Taxes. To develop a revision to existing ASPR cost principles to assure that Opinion No. 11 of the Accounting Principles Board of the American Institute of Certified Public Accountants that "income tax expense should include tax effects of revenue and expense transactions included in the determination of pretax accounting income," shall not apply to allowable costs. A proposed revision of the 15-205.41 paragraph to accomplish the foregoing was forwarded to industry for comment on June 10, 1968. Industry comments have been received and are currently being considered.

* **Preference for U.S. Flag Aircraft.**

* **CPFF Contracts and Progress Payments for Fixed-Price Contracts, Expediting Payment.**

** **Relocation Costs, ASPR 15-205.25.**

Evaluation of Options. To consider revising the ASPR policy on options, subject to approval by General Accounting Office, to provide criteria for the evaluation of options in conjunction with the initial solicitation, in certain limited situations (*e.g.* where it is anticipated the Government may exercise the option at time of award; there is a known requirement exceeding the quantity to be awarded, but due to the unavailability of funds the option cannot be exercised at time of award; etc.).

Limited Rights Legend. To consider developing a revision of the Limited Rights Legend and coverage in ASPR to clarify with particularity the use of limited rights data by the Government.

Clauses for Service Contracts. To develop a new Part for ASPR Section VII to cover service contracts generally, incorporating by reference, to the extent feasible, the fixed-price and cost-reimbursement clauses contained in Parts 1 and 2 of Section VII.

Organization Costs, ASPR 15–205.23. To consider the development of a revision to the subject ASPR cost principles to identify mergers and acquisitions as a part of organization and reorganization costs, and to clarify that both the cost of employees and outside services involved in such actions are unallowable.

First Article Approval. To consider revising the First Article Approval policy set forth in Section I, Part 19, in light of the difficulties which have been experienced both by the Government and by industry under the existing ASPR coverage.

Revision of the CWAS Coverage. To consider recommendations submitted by the IAC Working Group to lower the threshold and also extend the CWAS coverage to certain areas of administrative controls now excluded from the CWAS coverage.

Proposed ASPR 9–203(f) Clause, Rights in Technical Data—For RDT&E and Acquistion Contracts for Major Systems and Subsystems. To consider modifying the ASPR policy concerning rights in technical data insofar as RDT&E and acquisition contracts for major systems and subsystems are concerned, by prescribing a special clause for inclusion in prime major systems and prime subsystems RDT&E contracts which would require the contractor to permit subcontractors to sell subcontractor fabricated parts or services directly to the Government without the payment of license fees or other inhibition, notwithstanding that such subcontractor effort may require the use of limited rights data furnished by the prime contractor.

Mandatory Application of ASPR Cost Principles in Fixed-Price Contracts. To develop a revision of ASPR Section XV, Part 6, to make use of the cost principles set forth in Parts 2, 3 and 4 mandatory in fixed-price contracts whenever costs are relevant in the pricing of fixed-price contracts.

Multiple Incentive Contracts

(Continued from page 6)

Soon after POESMIC officially opened, each Service issued a policy letter on use of POESMIC resources. All Army, and Navy and Air Force multiple-incentive contracts over $5 million must be structured with the aid of the POESMIC services. To date, POESMIC has had 52 actions totaling about $10 billion.

For readers interested in more information about these techniques, POESMIC has two manuals, one detailed and the other condensed, covering the evaluation and structuring programs. They are:

- USAF Academy Consulting Team Report on the Evaluation and Structuring Techniques of Multiple Incentive Contracts.
- Training Manual for Orientation Course on Evaluating and Structuring Multiple-Incentive Contracts.

Three 16mm films are also available:

- Visibility in Structuring Multiple Incentive Contracts.
- Tradeoff Analysis in the Evaluation of Multiple Incentive Contracts.
- Value Statement Technique for Structuring Multiple Incentive Contracts.

These manuals and films may be obtained from Space and Missile Systems Organization, Attention: SMKPD, Los Angeles Air Force Station, Los Angeles, Calif. 90045.

As the result of a study recently completed by the Assistant Chief of Staff for Studies and Analysis, Headquarters, U.S. Air Force, an additional manual and film will be available from POESMIC in the near future. Both will carry the title "Government Value Analysis in Multiple Incentive Contracts."

Almost 60 years have passed since the first performance incentive contract was awarded. Hopefully, modern multiple incentive contracts will motivate modern contractors to exceed specifications and requirements as much as the Wright Brothers did.

New Test for Solid Propellant Rockets

A new technique used in testing solid propellant rocket motors in high altitude simulation test cells at the Air Force System Command's Arnold Engineering Development Center in Tennessee is providing information in motor performance which could not be acquired previously.

Until now, solid propellant motors were installed in the test cell on a semi-rigid stand which interfered with acquisition of precise ignition data.

The new technique permits the rocket motor to move forward virtually unrestricted, as it would in flight during the fraction of a second it takes for ignition of the propellant to become complete. Shock and acceleration forces are measured as the motor moves, and the data are free of inputs from support hardware interactions.

Engineers for ARO, Inc., contract operator of the Arnold Center, devised the technique for tests of the third-stage motor for a new model of the Athena booster system which is used in reentry experiments.

The third stage motor drives the payload back into the atmosphere and too much of a jolt during ignition could damage the delicate instruments in the payload. Primary objective of the test was, therefore, to determine if the instruments would be adequately insulated from the forces produced during ignition.

A secondary objective of the test was to determine tail-off characteristics at a simulated high-altitude. A sea level test by the manufacturer had indicated the motor continued to produce low levels of thrust for an abnormally long time after design burn-out. If this happened in flight, the additional thrust could drive the third stage into the payload and also damage the instruments after separation.

To accomplish the secondary objective, a special pressure probe system, also designed and developed at Arnold Center, was inserted in the motor case through the nozzle and six inches into the combustion chamber immediately after design burn-out time had been reached. Results showed no evidence of extended tail-off, indicating that the additional thrust recorded in the sea level test was produced by conditions not existent at high altitudes.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Maj. Gen. John S. Patton, Air Force Reserve, has been designated Chairman of the Reserve Forces Policy Board, which acts through the Asst. Secretary of Defense (Manpower & Reserve Affairs).

Col. Stewart C. Meyer, USA, brigadier general designate, has succeeded **Brig. Gen. Allen M. Burdette**, USA, as assistant to Dep. Dir. of Defense Research & Engineering (Tactical Warfare Programs).

DEPARTMENT OF THE ARMY

Lt. Gen. James B. Lampert has been designated by the Secretary of Defense to succeed **Lt. Gen. Ferdinand T. Unger** as Commanding General, U.S. Army Ryukyu Islands/IX Corps and High Commissioner of the Ryukyu Islands. Gen. Unger has been named to be Dir., Civil Disturbance Planning & Operations, Office of the Chief of Staff, U.S. Army. The Ryukyu Islands, situated south of Japan, include the strategic island of Okinawa, site of a huge military complex. The islands are administered by the United States in accordance with the peace treaty signed with Japan at the end of World War II.

Brig. Gen. Donald D. Blackburn has succeeded **Brig. Gen. Thurston T. Paul** as Dir., Plans and Programs, Office of the Chief of Research & Development.

Dr. Sidney Ross has been selected to serve as Technical Director of Research and Engineering at Frankford Arsenal, Philadelphia, Pa.

Resignation of **Dr. Ralph G. H. Siu**, Dep. Dir., Developments & Engineering, Army Materiel Command, has been announced.

Col. John W. Ervin is the new chief of staff for the Army Electronics Command, Fort Monmouth, N.J.

Col. Harold A. Kissinger, brigadier general designate, has been assigned as Dep. for Operations, Army Electronics Command, Fort Monmouth, N.J.

Col. George M. Snead Jr., brigadier general designate, has succeeded **Brig. Gen. Charles D. Y. Ostrom Jr.** as Director of Army Research. Gen. Ostrom has assumed duel responsibility as Commanding General, Army Ordnance Center, and Commandant, Army Ordnance School, Aberdeen Proving Ground, Md.

Col. Nelson W. Tobey has been assigned as head of the Missiles and Space Directorate, Office of the Chief of Research & Development.

Col. Robert G. Todd is the new Dep. Commander, Army Automatic Data Field Systems Command.

Col. James E. Wirrick is the new Commanding Officer, Army Behavioral Science Research Laboratory, Washington, D.C.

DEPARTMENT OF THE NAVY

RAdm. Paul A. Holmberg has been named Vice Commander, Naval Air Systems Command. **RAdm. Raymond J. Schneider** succeeds Adm. Holmberg as Asst. Commander Naval Air Systems Command for Research and Technology.

Capt. Winthrop P. Robinson has been assigned as the new Commanding Officer, Navy Space Systems Activity, at Los Angeles, Calif., Air Force Station.

Capt. Thomas T. Scambos has been ordered to duty as Manager of the Navy's F–111B Project Office at Naval Material Command.

DEPARTMENT OF THE AIR FORCE

The Air Force Systems Command has made the following assignments of key positions:

Brig. Gen. Alton D. Slay, Commander, Air Force Flight Test Center, Edwards AFB, Calif.; **Col. David M. Critchlow**, Test Engineer, Dep. Sys. Test, Air Force Flight Test Center, Edwards AFB, Calif.; **Col. Gerald K. Hendricks**, Director, Air Mobility Div., Deputy for Limited War, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; **Col. William P. Lemme**, Dir. of Quality Assurance, Air Force Contract Management Div., Los Angeles, Calif.; **Col. Edward H. Risher**, Dir., Tech. Support, Armament Development & Test Center, Eglin AFB, Fla.; **Col. Theodore H. Runyon**, Chief of Staff, Aeronautical Systems Div. Wright-Patterson AFB, Ohio; **Col. Robert A. Rushworth**, Systems Program Dir., TAC Missile Programs, AGM–65A, Aeronautical Systems Div. Wright Patterson AFB, Ohio; **Col. Kenneth J. Sarchet**, Chief, Communications Div., Air Force Eastern Test Range, Patrick AFB, Fla.; **Col. James W. Wood**, Chief, Test & Development, FX System Program Office, Aeronautical Systems Div., Wright-Patterson AFB, Ohio, and **Lt. Col. Reese S. Martin**, Dir., Test & Deployment Div., F–111 Systems Program Office, Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

The Air Force Logistics Command has made the following assignments of personnel to key positions:

Col. Lester C. Mourer, Vice Commander, Advanced Logistics Systems Center, Wright-Patterson AFB, Ohio; **Col. Thomas E. Peddy**, Vice Commander, San Antonio Air Materiel Area, Kelly AFB, Tex.; **Col. Rowland H. Worrel Jr.**, Dir., Supply & Transportation, Warner Robins Air Materiel Area, Robins AFB, Ga., and **Col. Tom W. Robbins**, Chief, Operations Support Div., Logsitics Systems Center, Wright-Patterson AFB, Ohio.

Brig. Gen. William G. King Jr., has been assigned as Asst. to Dir. of Special Projects, Office of the Secretary of the Air Force, with duty station at Los Angeles, Calif., Air Force Station.

Col. James J. Dimel has been assigned as Commanding Officer, Holloman AFB, N.M., site of the Air Force Missile Development Center.

Col. Roy D. Ragsdale has been reassigned to the Air Force Security Service as Dir., Electronic Systems, Air Force Special Communications Center, Kelly AFB, Tex.

Lt. Col. John J. Whiteside has been named Chief of the Air Force Office of Information in New York, N.Y.

DOD Plastics Analysis Center Open to Industry Query

Harry E. Pebly Jr.
Norman E. Beach

A recent study found that DOD is ading about $100 million annually in identifiable research in materials, of which $22 million goes for organic materials—primarily plastics and polymers. About $12 million is spent on composites research, of which a significant fraction is for reinforced plastics. (This does not include programs in structures.)

In addition to the Defense Department, the National Aeronautics and Space Administration (NASA) is funding about $5 million in plastics and the Departments of Agriculture, Commerce (Bureau of Standards) and Interior also have programs, although of smaller size. The sum of all these must put the Federal Government close to the $40 million mark in plastics and polymers.

It is known there is a much larger amount (estimated as much as four times greater) spent in unidentified research and development as part of end-item development. Unfortunately the knowledge gained from this effort is reported in only a small amount.

There has been no estimate made of the amount of purchased plastic goods by the Federal Government. Such goods may be easily identified, either as semi-finished products such as film and rigid laminates or end items such as rocket cases, or unidentified and unsung components such as electrical insulation. The total amount is obviously tremendous. However, procurement is done by so many different groups, in such a variety of agencies and locations, it is logistically impossible to get an accurate picture of the grand total. There are over 1,000 government specifications pertaining to plastics.

The Plastics Technical Evaluation Center (PLASTEC) located at Picatinny Arsenal, Dover, N.J., is one of 28 Defense Department information analysis centers established as authoritative sources in particular fields of defense mission.. These centers try to answer requests for specific information from anyone connected with the defense effort. Several of them, including PLASTEC, publish reviews or state-of-the-art reports which are generally available for public sale, and they are usually well informed as to who is active in the field and what programs are underway. Through these centers the Government attempts to provide for the most effective use of the results of its research and development programs. (For a complete listing of DOD information analysis centers, see article on page 29 in this issue).

PLASTEC is the organization designated to collect, evaluate and disseminate technical information in the field of plastics, and has five materials specialists assigned to carry out the mission of the center. These specialists are able to supplement their knowledge with the talents available

Harry E. Pebly Jr. has been Director of PLASTEC since its organization in 1960. He holds a B.S. degree in Chemical Engineering from Penn State University and an M.S. degree from Stevens Institute. In 1966 he received a Certificate of Merit from the Reinforced Plastics Division of the Society of Plastics Industry.

Norman E. Beach has been Technical Publications Editor with PLASTEC for seven years. He is author of the book, "Plastic Laminate Materials," and nearly a dozen technical reports on military uses of plastics. A chemist for more than 20 years, he has a B.A. degree from New York University and an M.A. degree from Harvard University.

in the large plastics laboratory organic to Picatinny Arsenal.

PLASTEC has concentrated in four areas: reinforced plastics in electrical and electronic applications; plastics in packaging and plastics in mechanical goods. The center aspires to coverage of the entire plastics and polymer field. The forte of the center is thus the analysis and evaluation of information, and it is this aspect which distinguishes an information analysis center from a library.

The Army is assigned the responsibility by the Defense Department for the operation of PLASTEC. The center, however, serves the Navy and the Air Force as well.

In addition, the services of the center are available to defense contractors and suppliers. On this point, the situation is analogous to that in which the tail wagged the dog. A large majority of the inquiries made of PLASTEC come from government contractors or suppliers, and they constitute a large portion of the mailing list for output documents. At the same time, the defense industries are a prime source for input documents, and are constantly called upon for pieces of information required in evaluations conducted by the center.

The specific areas of activity entered into by PLASTEC are determined by direct requests for studies to be made, or by the trends which are noted among the many inquiries handled by the center.

To illustrate the former, recently the Army Tank Automotive Command requested a state-of-the-art survey of plastics sandwich construction, to obtain information useful for materials selection, design and fabrication of vehicle bodies, fire walls, ballistics resistant panels, sound deadening panels, and flotation units. As for the latter, repeated and diverse requests for information on a particular subject (filament winding techniques, low temperature properties, cryogenic effects, etc.) are taken as indication that a general need exists for that information.

Specific Techniques

PLASTEC	Short Title	Call Number
Report 1	Flake glass laminates	AD 244 104
Report 3	Electrical encapsulation	AD 247 865
Report 29	Electrical encapsulation	AD 648 420
Report 4	Package-cushioning	AD 273 400
*Report 10	Filament winding	AD 284 629
*Report 19	Filament winding	AD 457 593
Report 13	Fluidized-bed coating	AD 431 603
Note 18	Fluidized-bed coating	AD 666 224
Report 15	Plastics for tooling	AD 601 391
Report 16	Plastic gears	AD 605 396
*Report 22	Nondestructive testing	AD 472 712
Report 26	Reinforced thermoplastics	AD 637 721
Report 34	Sandwich construction	AD 673 713

* Not on public sale.

Figure 2.

Technical Conference Papers on Plastics

(Issued annually)

PLASTEC	Call Number	Year
Report 8	AD 264 775	1961
Report 11	AD 282 795	1962
Report 14	AD 423 560	1963
Report 17	AD 606 561	1964
Report 21	AD 620 142	1965
Report 27	AD 641 666	1966
Report 31	AD 660 954	1967
Report 35	(At press)	1968

Figure 1.

The natural repository for the technical information relating to plastics is the PLASTEC library. The library houses over 11,000 documents. These are, for the most part, reports of government agency projects or contracted studies. They are selected for call-in from various accession lists and from Current Awareness printouts from the Defense Documentation Center. Study of contract lists also provides valuable leads to potentially important documents.

The library holdings are incorporated in a continuing print-out system which provides for each item a formal citation and an abstract. The items are also indexed as to subject (under pertinent uniterms) and author. There is no loan-out system for the PLASTEC holdings; however, arrangement can be made for defense contractor personnel to visit the library for search and study.

Information is evaluated by a group of specialists, most of whom came to PLASTEC from industry. Since rapport with industry is vital to the operation of the center, they have established and they maintain contacts within their particular fields. This personal source of information is supplemented by day-to-day contact with plastics engineers in the arsenal's Materials Laboratory. In frequent cases, a call to the right person will produce an immediate answer.

The areas of interest in which competence exists in PLASTEC are listed below:

- Ablative materials.
- Aircraft uses.
- Composites.
- Compatibility.
- Corrosion applications.
- Cryogenic properties.
- Degradation.
- Electrical properties.
- Encapsulation.
- Filament winding.
- Laminates.
- Low temperature properties.
- Mechanical uses.
- Medical uses.
- Microbiological effects.
- Missile components.
- Molding, forming and extrusion.
- Nondestructive testing.
- Packaging applications.
- Printed circuits.
- Space environment effects.
- Specifications.
- Thermal insulation.
- Weathering.

The output of PLASTEC is of two

types: the inquiry response and the formal study report.

Many inquiries received by the center may be answered immediately or by call-back within a reasonable time. However, some may require a substantial investigation which usually results in the issuing of a response of some significance. Copies of these letter reports are kept on file, and are indexed for future use in answering related inquiries or for final expansion into formal reports.

Characteristic of these are selected reference lists or annotated bibliographies on particular subjects. These "unpublished reports" presently exceed 200 items; and, as with the library documents, are available to PLASTEC visitors for search and study.

The formal output of PLASTEC is discussed here rather fully, in order to bring to the attention of the reader the publications of the center which are available to him.

All reports may be obtained from the Defense Documentation Center (DDC), Cameron Station, Alexandria, Va. 22314, by those qualified for that service (see article "Programs and Services of the Defense Documentation Center," *Defense Industry Bulletin*, April 1968, page 1). They are distributed free in microfiche form, but there is now a charge of $3 for hard-cover copies. Users not qualified for DDC service can, in most cases, purchase PLASTEC reports from the Clearinghouse for Federal Scientific and Technical Information (CFSTI), 5285 Port Royal Road, Springfield, Va., 22151, at a cost of $3.

It was recognized long ago at PLASTEC that one area of information was not completely covered by other means. This is the wealth of technical knowledge which is presented at the various conferences held in this country and overseas, and published in sometimes quite limited editions of preprints or proceedings. As a guide to this information, the center annually prepares a subject index, bibliography and code description of those papers pertaining to plastics. Figure 1 cites the PLASTEC reports covering this area for the past eight years. These conference reports tell what has been presented on a particular subject and (by means of the code) what type of coverage is given in the particular papers. The source (conference and proceedings) is cited; also, the author and his affiliation.

Specific techniques reported on by the center are listed in Figure 2. These are largely state-of-the-art studies covering what has been done and what is being done on the stated subject, and including (as applicable) design considerations, material properties, and military uses. Second reports on the same subjects are bibliographical updatings or extensions on the techniques.

General Aids

PLASTEC	Short Title	Call Number
Report 5B	Directory in plastics	AD 642 574
Note 6A	Specifications list	AD 640 377
Note 9	Trade designations	AD 481 788
Note 14	Glossary of terms	AD 645 208
Note 17	Test methods	AD 662 049

Figure 4.

Design Aids

PLASTEC	Short Title	Call Number
Report 12	Space environment effects	AD 288 682
*Report 20	Cryogenic temperature properties	AD 469 126
Report 23	Electrical properties	AD 624 922
Report 24	Weathering	AD 630 987
Report 24	Weathering	AD 672 513
Report 25	Compability (liquid propellants)	AD 632 287
Report 33	Compatibility (solid propellants)	AD 672 061
Report 30	Low temperature effects	AD 661 633

*Not on public sale.

Figure 3.

Some of the studies executed by PLASTEC, while not tied-in with particular techniques, are of definite assistance to the design engineer in the selection of materials. These design aids are listed in Figure 3. The works cited are studies of material properties and behavior under selected environments, and as such they are valuable references in determining what has been experienced so far and what can be expected.

The output of PLASTEC has included reports of general value, as cited in Figure 4.

The directory (Report 5) is a guide to those people in various government segments (and in NASA and other government-contracted centers) who are knowledgeable in plastics, their research and development, and their uses in military applications. Provided is a subject index so that the reader can locate who to turn to for knowledge of a particular subject or item. The directory lists the name, segment, address and telephone number of that person. It also contains a list of personnel so that, given a name, the person can be reached. This directory, a most popular publication, is revised every three years. It is presently undergoing revision, with publication of Report 5C expected early in 1969.

As could be expected, the center received (and still receives) many inquiries as to "Is there a specification on ________?" or "What is covered by Type II of MIL-P-XXXX?" or "How do I get specification number ________?". Answering such questions prompted the compilation of a complete list of known government specifications and standards covering defense engineering plastic materials and applications (Note 6). In addition to identification media for the specifications, directions on procurement are included. This guide is re-

(*Continued on page 32*)

Scientific and Technical Information Analysis Centers

The Defense Department supports 28 Centers for analysis of scientific and technical information. Each center gathers information in its clearly defined, specialized area of interest, reviews, analyzes, evaluates, synthesizes, condenses, and summarizes the information, and provides it to individual users. These centers produce critical reviews, state-of-the-art monographs, data compilations, and substantive responses to queries.

DOD centers operate under the guidance of DOD Instruction 5100.45.

Each information analysis center is staffed by scientists, engineers and technicians who are skilled in the particular subject matter, and in information handling. These centers are distinguished from documentation centers and technical libraries, whose primary functions are handling documents, rather than the technical information contained in the documents.

A Directory of Federally Supported Information Analysis Centers is available from the Clearinghouse for Federal Scientific and Technical Information, National Bureau of Standards, U.S. Dept. of Commerce, Springfield, Va. 22151. Price is $3. The directory lists 113 centers.

DOD-operated centers are listed below:

Air Force Machinability Data Center

Address:
Metcut Research Associates, Inc.
3980 Rosslyn Drive
Cincinnati, Ohio 45209
Director:
John Maranchik Jr.
Point of Contact:
John Maranchik Jr.
(Alternate) Robert E. Snider
Phone : (513) 271-9510
DOD Cognizance:
Air Force Materials Laboratory (MAAM)
Wright-Patterson AFB, Ohio 45433

Collects, evaluates, stores and disseminates material removal information including specific and detailed machining data for the benefit of industry and government. Strong emphasis is given to engineering evaluation for the purpose of developing optimized material removal parameters. Provides specific and detailed answers to technical inquiries in the field of material removal. Maintains a User File, consisting of 3,500 important users in the field of material removal; these receive information products including machining data pamphlets and tables on materials of current interest, state-of-the-art reports, technical announcements, and other appropriate items. Services are provided to the industry, DOD (including all of the Military Services and their contractors), and other government agencies, technical institutions, and non-military industries in a position to assist the defense effort.

Ballistic Missile Radiation Analysis Center

Address:
University of Michigan
Institute of Science & Technology
P. O. Box 618
Ann Arbor, Mich. 48107
Director:
Dr. F. S. Simmons
Phone: (313) 483-0500, Ext. 314 or 315
Point of Contact:
Dr. Frank Sevcik
DOD Cognizance:
Fred Koether
Advanced Research Projects Agency
Department of Defense
Washington, D. C. 20301
Phone: (202) 697-8904

Collects, processes and disseminates information on the theory and technology associated with ballistic missile phenomena which may be useful in the design of defense systems. Analyzes and evaluates theoretical and experimental results from the radiation measurements program, with primary emphasis on the optical radiation emanating during the launch, mid-course and reentry regimes of missile flight. Conducts semi-annual AMRAC symposium and publishes and distributes proceedings.

Battelle-DEFENDER Information Analysis Center

Address:
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201
Director:
Robert S. Kohn
Phone: (614) 299-3151, Ext. 2041
DOD Cognizance:
Fred Koether
Advanced Research Projects Agency
Department of Defense
Washington, D. C. 20301
Phone: (202) 697-8904

Collects, processes and analyzes information in all disciplines covering research in defense against ballistic missiles. Provides a functional information system required to monitor existing and proposed work. Performs analyses and undertakes studies of critical system problems. Prepares state-of-the-art reports, technical summaries, compendiums and annotated accessions lists. Provides services to the entire DOD ballistic missile defense community.

Chemical Propulsion Information Agency

Address:
Applied Physics Laboratory
The Johns Hopkins University
8621 Georgia Ave.
Silver Spring, Md. 20910
Director:
Leland B. Piper
Phone: (301) 589-7700, Ext. 561
DOD Cognizance:
Robert Heitkotter
Naval Air Systems Command (AIR-330 D)
Washington, D. C. 20360
Phone: (202) 696-7989

Acquires information and data from government-sponsored programs in chemical propulsion technology; organizes information and data in publications useful to members of the rocket community including government organizations, industrial concerns, universities, institutes and consultants working with chemical rocketry; disseminates information and data through meetings, briefings, consultation and publications; serves as a central source for chemical propulsion contract information so that duplication in government-funded research and development programs may be minimized; provides Interagency Chemical Rocket Propulsion Group with status reports in specific areas of research and development to aid managerial decisions; provides technical data in response to inquiries from scientists and engineers engaged in chemical propulsion research and development.

Coastal Engineering Information Analysis Center

Address:
Coastal Engineering Research Center
5201 Little Falls Road, N. W.
Washington, D. C. 20016
Director:
Thorndike Saville Jr.
Phone: (202) HO 2-8000, Ext. 798
DOD Cognizance:
Office, Chief of Engineers
Washington, D. C. 20315

Collects, analyzes and disseminates information on coastal engineering research and technology. Services include the publication of annotated bibliographies, state-of-the-art reports, and the provision of library and consultation services.

Concrete Technology Information Analysis Center

Address:
U. S. Army Engineer Waterways
Experiment Station
P. O. Box 631
Vicksburg, Miss. 39180

Director:
Bryant Mather
Phone: (601) 922—1671, Ext. 33
DOD Cognizance:
Office, Chief of Engineers (ENGSA)
Washington, D. C. 20315

Acquires, analyzes, evaluates and condenses the world's literature in mass concrete materials, properties, construction methods, and tests; concrete composition; chemistry and physics of concrete and concreting materials; analytical procedures and test methods, portland cement grout mixtures. Services include specific items of evaluated data, current summaries or technical trends, comprehensive state-of-the-art analyses, and specialized advisory services.

Cultural Information Analysis Center
Address:
American University
Center for Research in Social Systems
5010 Wisconsin Ave., NW
Washington, D. C. 20016
Director:
James R. Price
Phone: (202) 244–7300, Ext. 272
DOD Cognizance:
Robert F. Chaillet
Scientific & Technical Information Div.
Army Research Office
Washington, D. C. 20315
Phone: (202) 694–1144

Provides a system with a rapid response capability for storing, retrieving and analyzing information for specific customer requests in the social sciences areas, regarding peoples, their societies, environments and behavior patterns. The center responds to requests from government agencies and their qualified contractors by providing analytical information, indepth studies, annotated bibliographies, consultant services and reviews. Input is collected from the information base provided by the extensive cross-cultural research program in the social sciences conducted by the Center for Research in Social Systems, as well as from information collected from academic, government and other research organizations and individuals.

DASA Information and Analysis Center
Address:
General Electric—TEMPO
816 State St.
Santa Barbara, Calif, 93102
Director:
Warren W. Chan
Phone: (805) 965–0551, Ext. 501
DOD Cognizance:
Lt. Colonel J. D. Brown, USA
Chief, Atmospheric Effects Div.
Defense Atomic Support Agency (DASA)
2020 14th St. N.
Arlington, Va. 22201

Serves as a collection point and reference center for all technical information pertinent to the effects of nuclear explosions. Its services are available to all responsible agencies and individuals conducting scientific investigations into the nature of nuclear weapon effects and their implications on present effects and their implications on present and future military systems. The center provides access to data from a wide variety of sources; announces, through its own publications, projected data collection programs, theoretical investigations, and experiments; frees other agencies from the responsibility for servicing requests for data; and forms a permanent archive of these data.

Defense Ceramic Information Center
Address:
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201
Director:
Winston Duckworth
Phone: (614) 299–3151, Ext. 475
DOD Cognizance:
Barry R. Emrich
Air Force Materials Laboratory
Wright-Patterson AFB, Ohio 45433

Collects, interprets and disseminates technical information about ceramics, primarily for structural and thermal-protective applications in military systems. The services of the center include answering technical inquiries, providing technical advisory services, and publishing data compilations, critical technical reviews, news of developments, and lists of accessions.

Defense Metals Information Center
Address:
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201
Director:
Roger J. Runck
Phone: (614) 299–3151, Ext. 668
Point of Contact:
Roy Endebrock
Phone: (614) 299–3151, Ext. 2926
DOD Cognizance:
Edward Dugger
Air Force Materials Laboratory (MAAM)
Wright-Patterson AFB. Ohio 45433

Collects, interprets and disseminates scientific and closely related materials. Subjects covered are properties, fabrication and application of aluminum, titanium, beryllium, magnesium, tungsten, molybdenum, columbium, tantalum, rhenium, stainless steels, hot-work die steels, low-alloy hardenable steels, nickel-base superalloys, cobalt-base superalloys, and iron-base superalloys. Provides answers to technical questions; information concerning current research and development projects and scientific or technical data or data compilations upon request. There is no organized loan service. Makes technical evaluation of the accuracy, quality and significance of information that has already been introduced into the system. Prepares state-of-the-art reviews, correlations of information, etc.; and provides technical consultant services.

Electronic Properties Information Center
Address:
Hughes Aircraft Co.
Centinela Ave. & Teale St.
Culver City, Calif 90230
Director:
Dr. Sheldon J. Welles
Phone: (213) 391–0711, Ext. 6596
DOD Cognizance:
R. F. Klinger
Air Force Materials Laboratory (MAAM)
Wright-Patterson AFB, Ohio 45433

Provides ready access to literature and experimental data relating to the electrical and electronic properties of all materials of importance in today's technology. Subjects covered are semiconductors, insulators, electroluminescent materials, thermionic emitters, ferroelectrics, ferrites, ferromagnetics, superconductors, metals, ceramics, electronic materials and documentation of electronic properties. Literature is abstracted and indexed into an automated search system. Data from the literature are evaluated and compiled into series of data sheets. Summary and state-of-the-art reports are also issued. Abstracts, which are included with requests for bibliographies, identify the materials and indicate the experimental data contained in the literature. Requests for specific or related data are likewise honored.

Great Lakes Physical Information Analysis Center
Address:
Lake Survey District
Corps of Engineers
630 Federal Bldg.
Detroit, Mich. 48226
Director:
Ronald J. Walton
Phone: (313) 622–6959
DOD Cognizance:
DOD Instruction 5100.45, July 28, 1964

Conducts selective acquisition, technical review and analysis, storage and retrieval, and dissemination of Great Lakes physical information to user-oriented agencies as directed.

Human Engineering Information and Analysis Service
Address:
Tufts University
Systems Bldg.
Medford, Mass. 02155
Director:
Dr. Paul G. Ronco
Phone: (617) 623–6802
DOD Cognizance:
Dr. Leon Katchmar
Systems Research Laboratory
Human Engineering Laboratory
Aberdeen Proving Ground, Md. 21005
Phone: (301) 278–4401

Conducts document acquisition; abstracting and coding of documents; preparation of indexing or categorizing schemes; and dissemination of human factors information in the form of user products such as an annual annotated bibliography of the literature, special bibliographies covering specific topic areas, and critical reviews of topic areas.

Hydraulic Engineering Information Analysis Center
Address:
U. S. Army Engineer Waterways
Experiment Station
P. O. Box 631
Vicksburg, Miss. 39180
Director:
Ellis B. Pickett
Phone: (601) 636–3111, Ext. 368
DOD Cognizance:
Office, Chief of Engineers (ENGSA)
Washington, D. C. 20315

Acquires, analyzes, evaluates and condenses the world's literature on river, harbor and tidal hydraulics; flow through pipes, conduits, channels and spillways as related to flood control and navigation; hydraulic design and performance of dams, locks, channels and other structures; and water waves and underwater shock effects. Services include specific items of evaluated data, current summaries or technical trends, comprehensive state-of-the-art analyses, and specialized advisory services.

Infrared Information and Analysis Center
Address:
University of Michigan
Institute of Science and Technology
Box 618
Ann Arbor, Mich. 48107
Director:
Thomas Limperis
Phone: (313) 483–0500, Ext. 281

DOD Cognizance:
F. B. Isakson
Code 421 (Physics Branch)
Office of Naval Research
Washington, D. C. 20360
Phone: (202) 696–4332

Collects, analyzes and disseminates information on infrared physics and technology (including such areas as solid state physics, radiation physics and optics, infrared detectors, atmospheric phenomena, information processing, military infrared equipment, and industrial and medical infrared). Services include the publication of quarterly annotated bibliographics, state-of-the-art reports, the proceedings of the infrared information symposia, the sponsorship of symposia, and provision of library and consultation services.

Mechanical Properties Data Center
Address:
Belfour Stulen, Inc.
13919 W. Bay Shore Drive
Traverse City, Mich. 49684
Director:
A. J. Belfour
Phone: (616) 947–4500
DOD Cognizance:
Richard Klinger
Air Force Materials Laboratory (MAAM)
Wright-Patterson AFB, Ohio 45433

Prepares and distributes raw and evaluated strength data of materials on a periodic basis and in response to specific questions. Operates a system for storage, retrieval, evaluation and presentation of materials test information. Subjects covered are mechanical properties of structural materials with primary emphasis on metals, plastics secondary, including test procedures, material formulation, processing and environments; and includes statistical evaluation of data. Prepares and disseminates the Aerospace Structural Metals Handbook.

Military Entomology Information Service
Address:
Armed Forces Pest Control Board
Forest Glen Section
Walter Reed Army Medical Center
Washington, D. C. 20012
Director:
Lt. Colonel Daniel J. Reynolds, MSC, USA
Phone: (202) 576–5365
DOD Cognizance:
Armed Forces Pest Control Board

Organizes information relating to military entomology and associated fields, and provides for its storage and retrieval. Responds to requests from individuals or organizations for specific information on military entomology, and automatically distributes periodically annotated bibliographic citations of special accessions.

National Oceanographic Data Center
Address:
Navy Yard Annex, Bldg. 160
Washington, D. C. 20390
Director:
Dr. Thomas S. Austin
Phone: (202) 693–2249
DOD Cognizance:
Naval Oceanographic Office
Suitland, Md. 20331

Serves as an interagency activity supported by 10 Federal agencies and is primarily a central repository for the nation's oceanographic data. Receives, compiles, processes and preserves oceanographic data for rapid retrieval, and prepares data summaries, tabulations and atlases showing annual, seasonal, and monthly oceanographic conditions.

Nondestructive Testing Information Analysis Center
Address:
Army Materials & Mechanics Research Center
Watertown, Mass. 02172
Director:
Charles P. Merhib
Phone: (617) 926–1900, Ext 265 or 507
DOD Cognizance:
Army Materials & Mechanics Research Center

Collects, maintains and disseminates information in the field of nondestructive testing. Disseminates information upon request to government installations and others. Publishes newsletters and report guides to literature in various sub-fields of nondestructive testing. Renders technical advice and assistance upon request.

Pavements and Soil Trafficability Information Analysis Center
Address:
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631
Vicksburg, Miss. 39180
Director:
W. J. Turnbull
Phone: (601) 636-3111, Ext. 234
DOD Cognizance:
Chief of Engineers (ENGSA)
Washington, D. C. 20315

Acquires, analyzes, evaluates and condenses world's literature in subjects of flexible and rigid pavements, expedient surfacing, surface vehicle mobility and trafficability research, ground flotation, and research in terrain evaluation as relevant primarily to military needs. Services include specific items of evaluated data, current summaries or technical trends, comprehensive state-of-the-art analyses, and specialized advisory services.

Plastics Technical Evaluation Center
Address:
Picatinny Arsenal, Bldg. 3401
Dover, N. J. 07801
Director:
Harry E. Pebly Jr.
Phone: (201) 328-4222
DOD Cognizance:
Dr. Peter R. Kosting
Army Materiel Command
Washington, D. C. 20315

Collects and evaluates technical information on plastic materials and application of interest to DOD. Distributes information to DOD activities, their designees, or other organizations with demonstrable defense supporting interests upon request. Renders technical advice and assistance on plastics to DOD activities upon request.

Radiation Effects Information Center
Address:
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201
Director:
Donald J. Hamman
Phone: (614) 299–3151, Ext. 2553
DOD Cognizance:
Defense Atomic Support Agency
2020 14th St. N.
Arlington, Va. 22201

Collects, screens and analyzes information on radiation effects on a wide range of materials and devices. Prepares state-of-the-art review reports, memoranda, and accession lists. Provides inquiry answering service on specific technical questions. Provides personal access to information for representatives of government agencies and their contractors, with need to know and appropriate security clearance.

Reliability Analysis Center
Address:
IIT Research Institute
10 W. 35th St.
Chicago, Ill. 60616
Director:
George Jacobi
Phone: (312) 225–9630
DOD Cognizance:
Milton Haus
Rome Air Development Center (EMERR)
Griffiss AFB, N. Y. 13440
Phone: (315) 330–2020

Collects, stores, organizes, reviews, assesses, analyzes and disseminates information and experience data bearing on reliability of microelectronic devices and semiconductor transistors and diodes, and the influence and contribution of part design, material, manufacturing techniques, processing, configuration, testing practices, screening practices and electrical and environmental stresses on the nature of failures encountered during fabrication, testing and operation. Emphasis is placed upon those parts and devices which are expected to be used in future design of DOD equipment and which will be of most immediate significance to electronic government-industry complex. Provides answers to technical questions and consultant services. Prepares data compilations, reliability notebooks, monographs, abstracts, and bibliographies.

Remote Area Conflict Information Center
Address:
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201
Director:
J. Tuck Brown
Phone: (614) 299–3151, Ext. 3116
DOD Cognizance:
Fred Koether
Advanced Research Projects Agency
Department of Defense
Washington, D. C. 20301
Phone: (202) 697–8904

Collects, stores and disseminates information on overseas defense research, emphasizing the physical and engineering sciences aspects. Provides functional information system required to monitor research in counterinsurgency. Performs analyses and issues state-of-the-art reports and technical summaries.

Shock & Vibration Information Center
Address:
Naval Research Laboratory
Code 6020
Washington, D. C. 20390
Director:
Dr. W. W. Mutch
Phone (202) 767–2220
DOD Cognizance:
Office of Naval Research
Washington, D. C. 20360

Serves DOD, National Aeronautics and Space Administration, and their contractors by collection, correlation and dissemination of needed information on the environmental factors shock and vibration.

Soil Mechanics Information Analysis Center
Address:
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631
Vicksburg, Miss. 39180

Director:
A.A. Maxwell
Phone: (601) 636–3111, Ext. 497
DOD Cognizance:
Chief of Engineers (ENGSA)
Washington, D. C. 20315

Acquires, analyzes, evaluates and condenses literature on the subjects of soil mechanics soil physics, engineering geology, and embankment and foundation engineering, as related to stability and dynamics of foundations, structures, navigation and flood control, erosion, shock attenuation, and load carrying. Services include specific items of evaluated data, current summaries or technical trends, comprehensive state-of-the-art analyses, and specialized advisory services.

Thermophysical Properties Research Center
Address:
Purdue University
Research Park
2595 Yeager Road
W. Lafayette, Ind. 47906
Director:
Dr. Y. S. Touloukian
Point of Contact:
W. H. Shafer
Technical Inquiry Coordinator
Phone: (317) 743–3827
DOD Cognizance:
John Charlesworth
Air Force Materials Laboratory (MAAM)
Wright-Patterson AFB, Ohio 45433

Provides scientific and technical information based on critical evaluation of previous data and, if necessary, new measurements and/or calculations in the thermophysical properties field. Conducts experimental research on new determinations to fill in gaps and to reconcile discordant data of the thermophysical properties. Major reference works are available through commerical publishers and information services are available upon request.

VELA Seismic Information and Analysis Center
Address:
University of Michigan
P. O. Box 618
Ann Arbor, Mich, 48107
Director:
Robert Lormand
Phone: (313) 483–0500, Ext. 294
DOD Cognizance:
Donald Clements
Advanced Research Projects Agency
Department of Defense
Washington, D. C. 20301
Phone: (202) 695–7087

Collects, processes and disseminates seismic and related information for the VELA UNIFORM program. Analyzes information and issues technical summaries and state-of-the-art reports. Prepares special bibliographies, information digests and monographs.

Plastics Analysis Center

(*Continued from page 28*)

vised every three years. The latest revision is presently under way, with publication (as Note 6B) expected also early in 1969.

The other guides also evolved from recognition of a general need. The glossary (Note 14) is a consensus of the opinions of what the terms relating to plastics mean. It would be of no great help to the specialist, but of considerable value to anyone new (or occasional) in the field. It has been quite well received by sales personnel.

The guide to test methods (Note 17) is a rearrangement of the normal "test method subject" order into "subject-test method" order. It tells where to look for a ready-made test method to suit the need.

As for the list of trade designations (Note 9), it is recognized that although the list was quite authoritative at time of compilation, it was probably somewhat dated by the time it came off the press. The center maintains a write-in list of new trade names (based on Note 9) with possible publication of a revision in future. However, since trade names do get into military drawings, and since the trade designations get pushed into the background by newer materials, the PLASTEC note stands helpful to the succeeding generations.

To receive notice of PLASTEC publications in particular areas of interest, companies should file a Field-of-Interest Register form with the center. This form may be requested from PLASTEC, Picatinny Arsenal, Dover, N.J. 07801.

In the past the inquiry services and reports of PLASTEC (and other DOD centers) have been available without cost to qualified government contractors and suppliers. However, the Office of the Director of Defense Research and Engineering has requested that the centers plan an orderly transition to a schedule of charges for services, and initiate such a program before the end of FY 1969.

While brief and simple questions will still be answered free, there will be a charge, based on the hours used in retrieving and analyzing information for detailed inquiries. State-of-the-art reports and other formal publications will also be sold at a price designed to assure recovery of publication costs.

Air Force Awards FX Radar Contracts

The Air Force has awarded contracts to Westinghouse Electric Corp., Baltimore, Md., and Hughes Aircraft Co., Culver City, Calif., for competitive development of a new attack radar system for the FX advanced tactical air superiority fighter.

The contracts will total about $22 million during FY 1969 and FY 1970, including an initial obligation of $3,941,500 to each contractor. The winner from this 20-month competitive development program will be selected after both radar prototypes are flight tested and results are evaluated.

First Flight Test for Beryllium Rudder

A lightweight beryllium rudder attached to an Air Force F–4 fighter aircraft has successfully sustained flight loads of 190 percent of the structure's design limit.

The test marked the first time that a large structure of high strength-to-weight beryllium had been tested in actual flight.

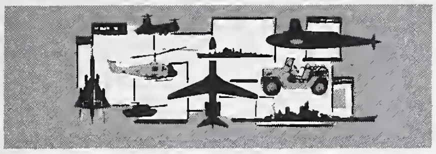
McDonnell Douglas Corp., St. Louis, Mo., built and is testing the rudder for the Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio.

Laboratory officials report that the rudder not only successfully sustained 190 percent of the design limit load for vertical fin and rudder bending, but also successfully held up under design limit loads about the hinge moment (side to side forces). The two forces acted upon the rudder at the same time during actual flight.

Nearly 43 hours of flight tests have been recorded on the beryllium rudder and tests will continue through 60 hours. Prior to flight tests, the rudder successfully passed a 50,000 cycle balance weight fatigue test, and checkout on three flight simulation static tests.

Although beryllium is four times as stiff and 30 percent lighter than aluminum, its use has been restricted because of its low ductility, high cost and poor machining qualities.

Weight of the beryllium rudder used in the tests was about 42 pounds. Similar rudders made of aluminum weigh about 64 pounds. Tests are expected to continue through early 1969.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of November 1968.

DEFENSE SUPPLY AGENCY

4—**Hunt Wesson Foods, Inc.,** Fullerton, Calif. $1,113,771. 258,806 cases of tomato catsup. Defense Personnel Support Center, Philadelphia, Pa. DSA 137–69–C–CA97.

5—**Rolane Sportswear, Inc.,** Ridgely, Tenn. $1,081,614. 178,653 coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0760.

—**Apparel Corp. of America,** Knoxville, Tenn. $1,201,347. 188,000 coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0761.

—**Alpha Industries, Inc.,** Knoxville, Tenn. $1,470,184. 240,830 coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0762.

6—**Burlington Industries,** New York, N.Y. $1,569,200. 2,000,000 yards of wind resistant poplin rip-stop cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0785.

—**C. M. London Co.,** New York, N.Y. $1,697,400. 2,000,000 yards of wind-resistant poplin rip-stop cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0785.

—**Reeves Bros., Inc.,** New York, N.Y. $1,026,000. 1,200,000 yards of wind-resistant poplin rip-stop cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0787.

—**Putnam Mills,** New York, N.Y. $1,234,090. 601,000 linear yards of nylon ballistic cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–065[illegible]

—**Sportwelt Shoe Co.,** Nashua, N.H. $1,007,109. 166,528 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0775.

7—**General Foods Corp.,** White Plains, N.Y. $1,069.455. Instant rice. Defense Personnel Support Center, Philadelphia, Pa. DSA 130–69–C–M060.

8—**Burlington Industries,** New York, N.Y. $1.554,880. 452,000 yards of serge polyester wool cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0697.

13—**Raymond Corp.,** Rockville, Md. $1,151,969. Electric fork lift trucks. Defense General Supply Center, Richmond, Va. DSA 400–69–C–2461.

14—**J. P. Stevens & Co.,** New York, N.Y. $3,489,960. 4,000,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Center, Philadelphia, Pa. DSA 100–69–C–0847.

—**Prestex, Inc.,** New York, N.Y. $1,185,990. 1,300,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0846.

—**Marion Mfg. Co.,** Marion, N.C. $1,169,000. 1,400,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0848.

—**Iselin Jefferson Co.,** New York, N.Y. $1,468,927. 1,604,000 yards of wind-resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0845.

15—**Ojus, Inc.,** Miami, Fla. $3,029,563. 100,000 rolls of barbed concertina tape and 56,708 cases of barbed tape. Defense Construction Supply Center, Columbus, Ohio.

—The Defense Fuel Supply Agency, Alexandria, Va., has awarded the following nine contracts for JP–5 jet fuel:

Mobil Oil Corp., New York, N.Y. $11,448,480. 109,500,000 gallons. DSA 600—69–D–0898.

Humble Oil & Refining Co., Houston, Tex. $10,557,500. 96,500,000 gallons. DSA 600–69–D–0896.

Douglas Oil Co., Los Angeles, Calif. $2,895,900. 23,000,000 gallons. DSA 600–69–D–0888.

Powerine Oil Co., Sante Fe Springs, Calif. $2,715,860. 20,000,000 gallons. DSA 600–69–D–0901.

Sun Oil Co., Philadelphia, Pa. $2,217,600. 20,160,000 gallons. DSA 600–69–D–0902.

Phillips Petroleum Co., Bartlesville, Okla. $1,652,275. 12,470,000 gallons. DSA 600–69–D–0900.

Hess Oil & Chemical Co., Woodbridge, N.J. $1,165,500. 10,500,000 gallons. DSA 600–69–D–0895.

Fletcher Oil & Refining Co., Wilmington, Calif. $1,704,537. 12,500,000 gallons. DSA 600–69–D–0890.

Beacon Oil Co., Hanford, Calif. $1,103,254. 8,100,000 gallons. DSA 600–69–D–0887.

—The Defense Fuel Supply Agency, Alexandria, Va., has awarded the following 42 contracts for JP–4 jet fuel:

Humble Oil & Refining Co., Houston, Tex. $32,832,243. 327,822,000 gallons. DSA 600–69–D–0846.

Standard Oil Co., San Francisco, Calif. $25,113,790. 212,616,400 gallons. DSA 600–69–D–0874.

Mobil Oil Corp., New York, N.Y. $21,971,453. 196,590,000 gallons. DSA 600–69–D–0856.

Coastal States Petrochemical Co., Houston, Tex. $12,044,386. 117,140,000 gallons. DSA 600–69–D–0825.

Continental Oil Co., Houston, Tex. $11,517,429. 114,527,000 gallons. DSA 600–69–D–0827.

American Oil Co., Chicago, Ill. $9,467,395. 89,865,000 gallons. DSA 600–69–D–0810.

Sun Oil Co. Philadelphia, Pa. $8,412,980. 79,400,000 gallons. DSA 600–69–D–0876.

Cities Service Oil Co., New York, N.Y. $8,008,639. 81,865,000 gallons. DSA 600–69–D–0824.

Phillips Petroleum Co., Bartlesville, Okla. $7,089,430. 60,160,000 gallons. DSA 600–69–D–0864.

Ashland Oil & Refining Co., Ashland, Ky. $6,711,315. 65,180,000 gallons. DSA 600–69–D–0814.

Golden Eagle Refining Co., Los Angeles, Calif. $6,029,796. 49,350,000 gallons. DSA 600–69–D–0840.

Delta Refining Co., Memphis, Tenn. $4,733,275. 45,230,000 gallons. DSA 600–69–D–0829.

Getty Oil Co., New York, N.Y. $4,619,538. 42,571,000 gallons. DSA 600–69–D–0838.

Fort Worth Refining Co., Houston, Tex. $4,605,342. 45,000,000 gallons. DSA 600–69–D–0837.

Fletcher Oil & Refining Co., Wilmington, Calif. $4,277,016. 34,500,000 gallons. DSA 600–69–D–0836.

Adobe Refining Co., Midland, Tex. $3,913,280. 34,825,000 gallons. DSA 600–69–D–0807.

American Petrofina Co., Dallas, Tex. $3,564,057. 36,117,000 gallons. DSA 600–69–D–0811.

MacMillan Ring-Free Oil Co., Los Angeles, Calif. $3,533,731. 29,307,000 gallons. DSA 600–69–D–0854.

Diamond Shamrock Corp., Amarillo, Tex. $3,347,548. 30,193,000 gallons. DSA 600–69–D–0831.

Southwestern Oil & Refining Co., Corpus Christi, Tex. $3,281,040. 33,600,000 gallons. DSA 600–69–D–0872.

Signal Oil & Gas Co., Houston, Tex. $2,953,500. 30,000,000 gallons. DSA 600–69–D–0868.

Hess Oil & Chemical Co., Woodbridge, N.J. $2,651,375. 27,626,400 gallons. DSA 600–69–D–0844.

Tesoro Petroleum Corp., San Antonio, Tex. $2,504,869. 21,500,000 gallons. DSA 600–69–D–0879.

Atlantic Richfield Co., Los Angeles, Calif. $2,488,344. 20,160,000 gallons. DSA 600–69–D–0815.

Douglas Oil Co., Los Angeles ,Calif. $2,456,000. 20,000,000 gallons. DSA 600–69–D–0832.

Sinclair Refining Co., New York, N.Y. $2,462,040. 25,200,000 gallons. DSA 600–69–D–0869.

Sioux Oil Co., Newcastle, Wyo. $2,450-,000. 20,000,000 gallons. DSA 600–69–D–0870.

Leonard Refineries, Alma, Mich. $2,436,866. 23,090,000 gallons. DSA 600–69–D–0853.

Tonkawa Refining Co., Houston, Tex. $2,114,881. 20,000,000 gallons, DSA 600–69–D–0881.

Edgington Oil Refineries, Long Beach, Calif. $2,103,719. 17,000,000 gallons, DSA 600–69–D–0833.

Kern County Refinery, Los Angeles, Calif. $2,090,868. 16,720,000 gallons. DSA 600–69–D–0850.

Okmulgee Refining Co., Okmulgee, Okla. $1,791,317. 19,070,000 gallons. DSA 600–69–D–0860.

Southwestern Pallet Co., Abilene, Tex. $1,582,818. 15,650,000 gallons. DSA 600–69–D–0873.

Crystal Flash Petroleum Corp., Indianapolis, Ind. $1,584,759. 13,750,000 gallons. DSA 600–69–D–0828.

Hunt Oil Co., Dallas, Tex. $1,064,800. 11,000,000 gallons. DSA 600–69–D–0847.

Famariss Oil & Refining Co., Hobbs, N.M. $1,037,440. 8,000,000 gallons. DSA 600–69–D–0835.

Monarch Refining Co., San Antonio, Tex. $1,037,086. 9,000,000 gallons. DSA 600–69–D–0858.

Southland Oil Co., Yazoo City, Miss. $1,028,469. 9,839,000 gallons. DSA 600–69–D–0871.

Bayou Refining Co., Pasadena, Tex. $1,560,490. 15,750,000 gallons. DSA 600–69–D–0817.

Cardinal Transports, Inc., San Antonio, Tex. $1,158,525. 11,000,000 gallons. DSA 600–69–D–0821.

Husky Oil Co., Denver, Colo. $1,124,199. 10,643,000 gallons, DSA 600–69–D–0848.

Hercules Oil Co., Long Beach, Calif. $1,100,081. 8,783,000 gallons. DSA 600–69–D–0843.

18—**Sinclair Refining Co.,** New York, N.Y. $1,238,741. 2,599,500 gallons of gasoline, 1,852,000 gallons of diesel fuels and 5,334,300 gallons of fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–0694.

—**Kern County Refinery,** Los Angeles, Calif. $1,119,158. 8,000,000 gallons of JP–5 jet fuel. Defense Fuel Supply Center, Alexandria Va. DSA 600–69–D–0897.

19—**The Defense Fuel Supply Center,** Alexandria, Va., has awarded the following three contracts for JP–4 jet fuel:

Gulf Oil Corp., New York, N.Y. $9,595,634. 89,418,000 gallons. DSA 600–69–D–0842.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting Agency—Contract Number.

Union Oil Co., Los Angeles, Calif. $8,198,336. 66,028,200 gallons. DSA 600–69–D–0883.

Triangle Refineries, Houston, Tex. $2,347,768. 21,060,000 gallons. DSA 600–69–D–0882.

—The Defense Fuel Supply Agency, Alexandria, Va. has awarded the following contracts for JP–5 jet fuel:

Golden Eagle Refining Co., Los Angeles, Calif. $4,924,882. 36,750,000 gallons. DSA 600–69–D–0891.

Gulf Oil Corp., New York, N.Y. $3,769,093. 36,868,150 gallons. DSA 600–69–D–0892.

20—The Defense Fuel Supply Center. Alexandria, Va. has awarded the following five contracts for JP–4 jet juel:

Good Hope Refineries, Houston, Tex. $4,590,000. 45,000,000 gallons. DSA 600–69–D–0841.

Texaco, Inc., New York, N.Y. $3,814,020. 37,800,000 gallons. DSA 600–69–D–0880.

Bell Oil & Gas Co., Bartlesville, Okla. $3,735,988. 38,488,000 gallons. DSA 600–69–D–0819.

Standard Oil Co., Cleveland, Ohio. $1,034,550. 9,500,000 gallons. DSA 600–69–D–0875.

Sunray DX Oil Co., Tulsa, Okla. $2,861,300. 31,130,000 gallons. DSA 600–69–D–0877.

—**Johnson & Johnson**, New Brunswick, N.J. $1,776,093. 2,456,242 packages of surgical sponges. Defense Personnel Support Center, Philadelhpia, Pa. DSA 120–69–C–1591.

21—**Choctaw Mfg. Co.**, Silas, Ark. $1,129,000. 529,244 pairs of white trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–0861.

22—**Gulf Oil Corp.**, Houston, Tex. $2,254,662. 12,724,000 gallons of gasoline, 2,815,000 gallons of diesel fuel and 206,000 gallons of fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–0197.

25—**Howell Refining Co.**, San Antonio, Tex. $3,018,372. 27,000,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69D0845.

—**Alabama Refining Co.**, Theodore, Ala. $1,913,057. 19,350,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–0808.

—The following four contracts have been awarded by the Defense General Supply Center, Richmond, Va., for chemical aluminum powder:

Alcan Aluminum Co., Elizabeth, N.J. $2,954,616. 9,347,000 lbs. DSA 400–79–C–2928.

Aluminum Co. of America, Pittsburgh, Pa. $22,463,072. 72,100,000 lbs. DSA 400–69–C–2932.

Reynolds Metal Chemical Co., Richmond, Va. $1,554,300. 4,950,000 lbs. DSA 400–69–C–2931.

Valley Metallurgical Co., Essex, Conn. $2,981,392. 10,045,800 lbs. DSA 400–69–C–2925.

26—**Atlantic Richfield Co.**, Philadelphia, Pa. $4,441,668. 42,000,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–0816.

29—**American Oil Co.**, Chicago, Ill. $3,647,695. 13,857,400 gallons of gasoline, 3,632,900 gallons of diesel and 7,658,000 gallons of fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–0160.

—**Hotchkiss Timer, Inc.**, Hotchkiss, Colo. $2,495,799. 281,693 wooden pallets. Defense General Supply Center, Richmond, Va. DSA 400–69–C–3061.

DEPARTMENT OF THE ARMY

1—**AVCO Corp.**, Stratford, Conn. $1,297,654. Housing assemblies for UH–1 helicopters. Aviation Materiel Command, St. Louis, Mo. AF–41–608–67–A–3234.

—**Philco Ford Corp.**, Newport Beach, Calif. $27,154,000. Chaparral fire units and weapon system test equipment. Anaheim, Calif. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0368.

—**TRW, Inc.**, Redondo Beach, Calif. $2,000,000. $1,500,000. Classified research and development. Electronics Command, Fort Monmouth, N.J.

—**Ford Motors**, Highland Park, Mich. $2,069,350. M151A1 utility trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06–68–C–0001.

—**Hercules, Inc.**, Wilmington, Del. $4,753,320. M4 electrical blasting caps. Port Ewen, N.Y. Picatinny Arsenal, Dover, N.J. DA AA21–69–C–0020.

—**Brown Engineering Co.**, Huntsville, Ala. $1,361,852. Technical support of the Sentinel Program. Sentinel Systems Command, Hunstville, Ala. DA HC60–69–C–0024.

—**Baldwin Construction Co.**, Marysville, Calif. $4,684,000. Construction of a 100-bed hospital and 16-chair dental facility at Mather AFB, Calif. Engineer Dist., Sacramento, Calif. DA CA05–69–C–0027.

4—**E. J. Walters Co.**, Elk Grove Village, Ill. $1,815,447. Metal parts for fuze bodies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0237.

—**General Motors**, Cleveland, Ohio. $1,688,600. Engineering design portion of Phase II of the productability cost reduction study for the Main Battle Tank. Fort Detrick, Md. DA AA13–68–C–0145.

—**Sperry Rand Corp.**, Phoenix, Ariz. $1,223,522 (contract modification). Compass set component parts. Army Procurement Agency, Pasadena, Calif. DA AG07–68–C–1290.

5—**Chamberlain Mfg. Corp.**, Elmhurst, Ill. $13,580,900. Metal parts for 155mm projectiles. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0187.

—**Z-D Products**, Costa Mesa, Calif. $2,016,000. 7.62mm ammunition links. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–V–0213.

6—**Crown Construction Co.**, Columbus, Ga. $3,134,761. Construction of 200 units of family housing with supporting utilities at Fort Benning, Ga. Engineer Dist., Savannah, Ga. DA CA21–69–C–0026.

—**Pace Corp.**, Memphis, Tenn. $2,336,560 (contract modification). Flares. Picatinny Arsenal, Dover, N.J. DA AA21–68–C–0497.

—**Bell Aerospace Corp.**, Fort Worth, Tex. $1,072,000. Modification kits for AH–1G helicopters. Hurst, Tex. Aviation Materiel Command St. Louis, Mo. DA AJ01–68–A–0022.

7—**Hamilton Watch Co.**, Lancaster, Pa. $10,848,195. Fuzes. East Petersburg, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0252.

—**Bell Aerospace Corp.**, Fort Worth, Tex. $4,104,000. AH–1G helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01–69–C–0252.

—**Cooper-Bessemer Co.**, Mt. Vernon, Onio. $4,055,825. Diesel-engine generator units and auxiliaries for Sentinel sites. Grove City, Pa. Engineer Dist., Huntsville, Ala. DA CA87–69–C–0008.

8—**Mason & Hanger, Silas Mason Co.**, Lexington, Ky. $23,920,918 (contract modification). Production of bombs, mines and support services. Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–68–C–0383.

—**Norris Industries**, Los Angeles, Calif. $3,393,000 (contract modification). Metal parts for 175mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–68–C–0520.

—**Amron Corp.**, Waukesha, Wis. $1,202,569. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0244.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $1,201,200. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0199.

—**Intercontinental Mfg. Co.**, Garland, Tex. $2,250,000 (contract modification). Metal parts for 152mm projectiles. Picatinny Arsenal, Dover, N.J. DA AA21–67–C–0598.

12—**Lockheed Aircraft**, Burbank, Calif. $2,810,068. Rotary wing blades, hydramatic servo cylinders and transmissions for AH–56A helicopters. Van Nuys, Calif. Aviation Materiel Command, St. Louis, Mo. DA AJ01–68–A–1749.

13—**Olin Mathieson Chemical Corp.**, New Haven, Conn. $1,088,791. 45-cal. cartridges. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–C–0220.

—**Studebaker Corp.**, Minneapolis, Minn. $2,338,830 (contract modification). 60KW generator sets. Mobility Equipment Research & Development Center, Fort Belvoir, Va. DA AK02–67–C–0136.

—**Litton Systems**, Sunnyvale, Calif. $2,192,000 (contract modification). Scientific and technical effort for the Combat Development Engineering Command. King City, Calif. Army Procurement Agency, Oakland, Calif. DA AG05–67–C–3096.

14—**Brunswick Corp.**, Sugar Grove, Va. $3,158,560 (contract modification). 16-tube, 35mm cartridge launchers. Edgewood Arsenal, Md. DA 18–035–AMC–00962.

—**Honeywell, Inc.**, New Brighton, Minn. $2,949,475. Bomb fuzes. Army Procurement Agency, Chicago, Ill. DA AA09–68–C–0490.

15—**Colt's Inc.**, Hartford, Conn. $30,312,469 (contract modification). M16, 5.56mm rifles and M16A1, 5.56mm refiles. Army Weapons Command, Rock Island, Ill. DA AF03–69–C–0021.

—**Garrett Corp.**, Phoenix, Ariz. $1,633,470 (contract modification). Repair parts for self-contained transportable medical units. Mobility Equipment Command, St. Louis, Mo. DA AK01–68–C–3858.

—**Stewart-Warner Corp.**, Lebanon, Ind. $1,948,991. 60mm projectile metal parts. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0040.

—**Booz-Allen Applied Research, Inc.**, Chicago, Ill. $1,796,020 (contract modification). 850 man months of scientific and technical effort and other support services in support of studies and analysis of military doctrine programs for the Combat Developments Command. Fort Leavenworth, Kan. Army Procurement Agency, Oakland, Calif. DA AG05–67–C–0437.

—**Norris Industries**, Los Angeles, Calif. $1,195,183 (contract modification). 152mm projectiles. Army Procurement Agency, Pasadena. Calif. DA AG07–68–C–1257.

—**Crowell Constructors**, Fayetteville, N.C. $1,179,748. Construction of a runway and taxiway with all supporting utilities at Pope AFB, N.C. Engineer Dist., Savannah, Ga. DA CA21–69–C–0029.

—**Western Electric**, New York, N.Y. $1,095,120. Nike-Hercules technical publications. Winston-Salem and Burlington, N.C. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0760.

—**Amron Corp.**, Waukesha, Wis. $3,136,635. Metals parts for M43A1 grenades. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0272.

—**Bulova Watch Co.**, Jackson Heights, N.Y. $1,832,292. Metal parts for 81mm mortar fuzes. Valley Stream, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0056.

—**AVCO Corp.**, Richmond, Ind. $1,749,965 (contract modification). Metal parts for general purpose bomb adapter boosters. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0119.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $1,745,560. Metal parts for 40mm practice projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0276.

18—**Rulon Co.**, Chicago, Ill. $7,430,500. Metal parts for artillery shell fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0266.

—**Hensel Phelps Construction Co.**, Greeley, Colo. $3,119,200. Construction of a 1,000-man dormitory at Lowry AFB, Colo. Engineer Dist., Omaha, Neb. DA CA45–69–C–0023.

—**Phillips Broadcase Equipment Corp.**, Paramus, N.J. $2,375,000. Far infrared target indicators. Mobility Equipment Command, Fort Belvoir, Va. DA AK02–69–C–0186.

—**General Construction Co.**, Fargo, N.D. $1,490,266. Construction on the Port Arthur Hurricane Protection Project, in Texas. Engineer Dist., Galveston, Tex. DA CW69–C–0035.

19—**Whittaker Corp.**, Columbus, Ohio, $2,463,920. Metal parts for 81mm cartridge fuzes, Westerville and Columbus, Ohio. Ammunition Procurement & Supply Agency. Joliet, Ill. DA AA 9 68–C–0275.

—**Bethlehem Steel**, Bethlehem, Pa. $1,692,702 (contract modification). 175mm gun tubes. Watervliet Arsenal, N.Y. DA AF07–68–C–0153.

—**S. Tepfer & Sons,** Deer Park, N.Y. $1,315,279 (contract modification). Metal parts for Shillelagh missile warhead sections. Ammunition Procurement & Supply Agency Joliet, Ill. DA AA09–68–C–0450.

—**Chrysler Corp.,** Warren, Mich. $2,858,948. Combat tanks and armed vehicle launcher bridges. Warren, Mich.; Dayton, Ohio; and Eynon, Pa. Army Weapons Command, Rock Island, Ill. DA AF03–68–C–0002.

—**I.D. Precision Components Corp.,** Jamaica, N.Y. $1,176,000. Metal parts for artillery ammunition fuzes. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill.

20—**Norris Industries,** Los Angeles, Calif. $11,140,421. Metal parts for 105mm cartridge cases. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill, DA AA09–69–C–0181.

—**Standard Container Co.,** Montclair, N.J. $4,845,000. Metal ammunition boxes for small arms. Homerville, Ga. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–C–0185.

—**Hughes Aircraft Co.,** Culver City, Calif. $2,214,952 (contract modification). Electronic items for Iroquois helicopters. Electronics Command, Fort Monmouth, N.J. DA AB07–68–C–0188.

—**Philco Ford Corp.,** Newport Beach, Calif. $1,728,508. 30mm guns without barrels for Cheyenne AH–56A helicopters. Anaheim, Calif. Army Weapons Command, Rock Island, Ill. DA AF03–69–C–0033.

—**Schlumberger, Ltd.,** Archbald, Pa. $1,611,000. Logic test set computers used to test the gun direction computer on the field artillery digital automatic computer. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–C–0235.

21—**Dynalectron Corp.,** Washington, D.C. $3,071,879. Data collection services for missiles in flight and other test vehicles. White Sands Missile Range, N.M. DA AD07–69–C–0032.

22—**Hansel-Phelps Construction Co. and Penner Construction Co.,** Greeley, Colo. $13,125,000. Construction of 10 enlisted men's barrack complexes and a road extension at Fort Riley, Kan. Engineer Dist., Kansas City, Kan. DA CA41–69–C–0030.

—**Brunswick Corp.,** Sugar Grove, Va. $3,054,400. CS filled canisters. Edgewood Arsenal, Md. DA AA15–69–C–0279.

—**Wilkinson Mfg. Co.,** Fort Calhoun, Neb. $1,921,500. 60mm mortar fin assemblies. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0282.

—**Associated Spring Association,** Bristol, Conn. $1,862,623. 5.56mm cartridge clip and filler magazines. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–C–0238.

—**Rohm & Haas Co.,** W. Philadelphia, Pa. $1,800,000. Solid propellant research. Huntsville, Ala. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0772.

—**Wire & Metal Specialties Corp.,** Warren, Mich. $1,749,126. 5.56mm cartridge clips. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–C–0239.

—**John R. Hollingsworth Co.,** Phoenixville, Pa. $1,338,918. Generator sets. Mobility Equipment Command, St. Louis, Mo. DA AK01–68–C–8526.

25—**Philco-Ford Corp.,** Newport Beach, Calif. $1,464,046 (contract modification). Continuation of a development/improvement program for the 30mm automatic weapon. Rock Island Arsenal, Rock Island, Ill. DA AF01–68–C–0687.

—**Bethlehem Steel,** Bethlehem, Pa. $2,156,107. Rough machined, alloy steel forging tubes for 175mm guns. Watervliet Arsenal, Watervliet, N.Y. DA AF07–69–C–0018.

26—**Day & Zimmermann, Inc.,** Philadelphia, Pa. $4,701,581 (contract modification). Loading, assembling, and packing miscellaneous items of ammunition and components. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. CPAF DA 11–173–AMC–00114(A).

—**U.S. Plastic Moulding, Inc.,** Wallingford, Conn. $1,208,840. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0279.

—**Continental Motors,** Muskegon, Mich. $2,411,330. Engine assemblies for M60 tanks. Tank Automotive Command, Warren, Mich. DA AE07–69–C–0534.

—**AVCO Corp.,** Stratford, Conn. $35,949,200 (contract modification). Turbine engines. Stratford, Conn., and Charleston, S.C. Aviation Materiel Command, St. Louis, Mo. DA AJ01–68–C–1874.

27—**United Aircraft,** Stratford, Conn. $3,000,000. Main rotor heads and gear boxes for CH–54 helicopters. Aviation Materiel Command, St. Louis, Mo. DA 23–204–AMC–03369.

—**Philips Broadcast Equipment Corp.,** Paramus, N.J. $1,214,120. Short range handheld viewers for the Night Vision Program. Mobility Equipment Command Research & Development Center Fort Belvoir, Va. DA AK02–69–C–0199.

—**UNECO, Inc.,** Bellevue, Neb. $3,932,372. Delay plungers for M557 fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0289.

—**American Bosch Arma Corp.,** Springfield, Mass. $1,485,367. Metering fuel pumps with compensators for 2½-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07–69–C–0513.

—**Deep South Construction Co.,** Montgomery, Ala. $3,189,156. Runway and road extension construction, exterior and interior underground electrical work, and excavation work. Columbus AFB, Miss. and Hamilton Field, Ala. Engineer Dist., Mobile, Ala. DA CA01–69–C–0017.

29—**Heyle & Patterson, Inc.,** Cocoa, Fla. $1,325,283. Construction of environment shelter for launch complex 40. Patrick AFB, Fla. Engineer Dist., Cape Canaveral, Fla. DA CA18–69–C–0008.

—**Federal Cartridge Corp.,** Anoka, Minn. $3,119,397. 5.56mm ball cartridges. Frankford Arsenal, Philadelphia, Pa. DA AA25–69–C–0084.

—**Whittaker Corp.,** Saugus. Calif. $2,351,160. Igniters for 2.75-inch rockets. Indio, Calif. Picatinny Arsenal, Dover, N.J. DA AA21–69–C–0310.

—**Aerojet General,** Downey, Calif. $1,212,855. Bomb dispensers. Army Procurement Agency, Pasadena, Calif. DA AA09–69–C–0025.

—**Collins Radio Co.,** Dallas, Tex. $1,114,500. Radio sets. Electronics Command, Philadelphia, Pa. DA AB05–67–C–0181.

—**Raytheon Co.,** Norwood, Mass. $3,822,000. Telephone signal converters. North Dighton, Mass. Electronics Command, Philadelphia, Pa. DA AB05–67–C–1011.

—**Chrysler Outboard Corp.,** Hartford, Conn. $4,127,652. 1, 1½ and 3 horsepower standard military engines. Mobility Equipment Command, St. Louis, Mo. DA AK01–69–C–3413.

—**Kaiser Jeep Corp.,** Toledo, Ohio. $10,009,217. 2½-ton trucks. General Purpose Vehicle Project Manager, Warren, Mich. DA AE06–68–C–0007.

—**Bendix Corp.,** Teterboro, N.J. $2,150,000. Ten sets of stabilized platform and amplifier control power supply for Pershing missile systems. Army Procurement Agency, New York, N.Y. DA AG25–68–A–0955.

—**Hayes International Corp.,** Birmingham, Ala. $1,275,300. M151 warheads for 2.75-inch rockets. Army Procurement Agency, Cincinnati, Ohio. DA AA09–69–C–0135.

—**Pullman Corp.,** Chicago, Ill. $3,296.475. Semi-trailers with Bogie assemblies. West Point, Pa. and Freemont, Calif. Tank Automotive Command, Warren, Mich. DA AE07–69–C–1103.

—**Baifield Industries,** Dallas, Tex. $2,354,000. Demountable body vans. Shreveport, La. Tank Automotive Command, Warren, Mich. DA AE07–69–C–1104.

—**Rohm & Hass Co.,** Philadelphia, Pa. $1,600,000. Propellant research. Huntsville, Ala. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0853.

—**Philco-Ford Corp.,** Newport Beach, Calif. $3,867,453. FY 1969 engineering services for the Chaparral missile. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0845.

—**Atlantic Research Corp.,** Alexandria, Va. $1,655,834. Loading of rocket motors for Redeye weapons system. Gainesville, Va. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0598.

—**Sanders Associates,** Bedford, Mass. $7,200,000. Production of forward area alerting radar and test equipment. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0749.

—**Hughes Aircraft,** Culver City, Calif. $55,371.527. Production of TOW missiles and related hardware. Tucson, Ariz. and El Segundo, Calif. Army Missile Command, Huntsville, Ala. DA AH01–68–C–2141.

—**Farmers Chemical Association, Inc.,** Tyner, Tenn. $1,801,800. Mixed acids. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00300 (A).

—**Hercules, Inc.,** Wilmington, Del. $9,892,021 (contract modification). Production of 2.75-inch rocket propellant and support services. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00042 (A).

—**Olin Mathieson Chemical Corp.,** New York, N.Y. $6,809,076 (contract modification). Production of various propellants and support services. Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0014.

—**General Motors,** Detroit, Mich. $5,363,276. Metal parts for 105mm projectiles and modernization and support activites. St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–67–C–0025.

—**Atlas Chemical Industries,** Wilmington, Del. $16,362,194 (contract modification). TNT and support services at the Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00531 (AA).

—**Norris Industries,** Los Angeles, Calif. $6,071,681 (contract modification). Continued maintenance of facility and activation of production lines for the 5-inch Navy shell at the Army Ammunition Plant, Riverbank, Calif; $2,143,478. M374 metal parts for 81mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00998 (A). DA AA09–69–C–0290

—**Bulova Watch Co.,** Providence, R.I. $2,660,000. Head assemblies for M525 fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0271.

—**Eureka-Williams Co.,** Bloomington, Ill. $6,579,166. Metal parts for 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0068.

—**Weatherhead Co.,** Cleveland, Ohio. $2,375,862 (contract modification). Metal parts for 105mm projectiles. Army Procurement Agency, Chicago, Ill. DA AA09–C–01115.

—**Honeywell, Inc.,** Hopkins, Minn. $7,995,579 (contract modification). M551 fuzes for 40mm cartridges. New Brighton, Minn. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0046.

—**Weatherhead Co.,** Cleveland, Ohio. $2,554,750. Metal parts for 4.2-inch projectiles. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0081.

—**ACF Industries, Inc.,** St. Louis, Mo. $1,999,800. M52 fuze bodies for M525 fuzes. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0145.

—**Hercules, Inc.,** Wilmington, Del. $1,407,841. M6 blasting caps. Port Ewen, N.Y. Army Procurement Agency, Chicago, Ill. DA AG11–69–C–0325.

—**Westinghouse Air Brake Co.,** Peoria, Ill. $3,263,841. Model 440HA road graders. Indianapolis, Ind. Army Mobility Equipment Command, St. Louis, Mo. DA 23–195–AMC–01083 (T).

DEPARTMENT OF THE NAVY

1—**Frequency Engineering Laboratories,** Farmingdale, N.J. $11,032,865. Production of basic point defense surface missile system. Naval Ordnance Systems Command. N00017–68–C–4404.

—**General Electric,** Washington, D.C. $2,696,000. Poseidon weapon training system services and material. Pittsfield, Mass. Strategic Systems Project Office. N00030–69–C–0128.

—**Norfolk Shipbuilding & Dry Dock Co.,** Norfolk, Va. $2,389,800. Regular overhaul of the land ship dock USS Spiegel Grove (LSD–32). Supervisor of Shipbuilding, Conversion & Repair, Fifth Naval Dist., Norfolk, Va.

—RCA, Van Nuys, Calif. $2,310,000. Classified electronic counter-measure equipment. Naval Ship Systems Command. N00024–69–C–1094.

—**Carrier Corp.,** Syracuse, N.Y. $1,497,034. Conditioning absorption plants for nuclear submarines. Naval Ship Systems Command. N00024–69–C–5215.

—**Martec, Inc.,** Decatur, Ala. $1,401,872. Shipping and storage containers for missiles. Naval Air Systems Command. N00019–69–C–0218.

4—**Clevite Corp.,** Cleveland, Ohio $10,000,000. Performance of studies to establish a basis for engineering development of a MK 48, MOD 1, torpedo and to fabricate and conduct engineering tests on development prototype models. Naval Ordnance Systems Command. N00017–67–C–1206.

—**Clymer Machine Co.,** Trumbauersville, Pa. $1,776,600. Fuses to be used in the 5-inch, 38-cal. gun loading program. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0131.

—**Metals Engineering Co.,** Greenville, Tenn. $1,742,851. Fin assemblies for MK 84, MOD 0, 2000-lb. bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0130.

5—**U.S. Steel,** Pittsburgh, Pa. $38,616,500. 500-lb bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0141.

—Saboca, Pittsburgh, Pa. $1,378,785. Carbon steel bars for use in M48 fuzes. Naval Ordnance Station, Forest Park, Ill. N00419–69–C–0155.

6—**Whittaker Corp.,** Saugus, Calif. $11,011,469. Aircraft parachute flares. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0154.

—**Kilgore Corp.,** Toone, Tenn. $6,528,012. Parachute flares. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0152.

—FMC Corp., Minneapolis, Minn. $2,905,627. Production of 5"/54 Cal. gun mounts, and related equipment. Fridley, Minn. Naval Ordnance Systems Command. N00017–68–C–4211.

7—**North American Rockwell Corp.,** Columbus, Ohio. $19,260,000 (contract modification). T–2C aircraft. Naval Air Systems Command. N00019–68–C–0346.

—**General Dynamisc,** Pomona, Calif. $12,045,210 (contract modification) Standard Arm missiles. Naval Air Systems Command. N00019–68–C–0074.

—**United Aircraft,** Stratford Conn. $7,500,000 (contract modification). Long lead time effort and materials in support of planned procuremene of CH–53A helicopters. Naval Air Systems Command. NOw–63–0150.

—**PRD Electronics,** Westbury, N.Y. $6,674,931 (contract modification). VAST building blocks and data transfer unit. Naval Air Systems Command. N00019–68–C–0449.

—**Palametto Construction Co.,** Charleston, S.C. $1,286,368. Construction of a maintenance dock for large aircraft. Charleston, S.C. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. N62467–67–C–0385.

—**J. Ray McDermott & Co.,** New Orleans, La. $1,107,131. Procurement of monomooring fueling buoys at the CB Center, Port Hueneme, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473–69–C–0009.

8—**General Electric,** Schenectady, N.Y. $9,486,000. Nuclear propulsion components. Naval Ship Systems Command. N00024–67–C–5321.

12—**Norris Industries,** Inc., Los Angeles, Calif. $15,143,360. MK 10, MOD 0, and MK 9, MOD 0, cartridge cases. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0126.

—**United Aircraft,** Hartford, Conn. $1,023,610. Modification kits for J–52P8A engines used on A–4 and A–6 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383–9–6900A–AF895.

—**Sperry Rand Corp.,** Great Neck, N.Y. $1,133,219. Equipment, instrumentation and control services. Naval Ship Systems Command N00024–69–C–0248.

14—**Norris Industries,** Los Angeles, Calif. $53,182,140. MK 82, MOD 1, 500-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg Pa. N00104–69–C–0134.

—**General Electric,** Schenectady, N.Y. $8,200,000. Nuclear propulsion research and development. Naval Ship Systems Command. N00024–67–C–5016.

—**Propulsion Systems, Inc.,** Port Washington, N.Y. $6,476,387. Gas turbine propulsion system production. King of Prussia, Pa. Naval Ship Systems Command. N00024–69–C–5226.

—**Atlas Fabricators,** Inc., Long Beach, Calif. $1,603,362. MK 12 pallets used in 5-inch gun programs and MK 82 and MK 83 bomb programs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0155.

—**Yuba Industries, Inc.,** Benicia, Calif. $1,683,840. Truck cover assemblies for catapults. Naval Supply Center, Oakland, Calif. N00228–69–C–0772.

—**Chrysler Corp.,** Detroit, Mich. $1,150,818. Design and construction of 10 riverine utility river craft(RVC). Naval Ship Systems Command N00024–69–C–0216.

—**G. C. Dewey Corp.,** New York, N.Y. $1,011,682. Electronic countermeasure systems. Naval Electronic Systems Command. N00039–69–C–3519.

—**Electromagnetic Technology Corp.,** Lansdale, Pa. $1,268,400. Manufacture of low frequency transmitting sets. Colmar, Pa. Naval Electronic Systems Command. N00039–69–C–1546.

—**Uniroyal, Inc.,** Providence, R.I. $2,049,739. Rubber cement shipping containers. Naval Facilities Engineering Command. N62578–69–C–0014.

—**Woods Hole Oceanographic Institution,** Woods Hole, Mass. $1,100,000. Surveys and analyses of ocean characteristics pertaining to acoustic transmission. Office of Naval Research.

19—**Norwest Marine Iron Works,** Portland, Ore. $1,390,826. Overhaul, drydocking, improvement of crew and sponsor personnel quarters and other repairs and alterations to the USNS General H. H. Arnold. Military Seal Transportation Service.

—**Curtiss-Wright Corp.,** Wood-Ridge, N.J. $1,050,136. Spare parts to maintain and overhaul R1820 engines. Aviation Supply Office, Philadelphia, Pa. F41608–67–A–5900–GBNU.

20—**Pennsylvania State University,** University Park, Pa. $7,465,000. MK 48 torpedo research and development. Naval Ordnance Systems Command. NOw65–0123–d.

21—**Beech Aircraft,** Wichita, Kan. $1,466,100 (contract modification). AQM–37A targets. Naval Air Systems Command. N00019–69–C–0174.

22—**Johns Hopkins University Applied Physics Laboratory,** Silver Spring, Md. $23,181,800. Bumblebee research and development. Naval Ordnance Systems Command. NOw 62–0604c.

—**Westinghouse Electric,** West Mifflin Borough, Pa. $9,725,000. Nuclear propulsion research and development. Naval Ship Systems Command. N00024–67–C–5015.

—**General Instrument Corp.,** Chicopee, Mass. $8,354,000. Bomb fuzes. Naval Air Systems Command. N00019–69–C–0277.

—**TRW Systems,** Washington, D.C. $8,267,968. Engineering services for an antisubmarine warfare systems project. Naval Ordnance Systems Command. N00017–69–C–1411.

—RCA, Princeton, N.J. $7,775,171. Navigation satellites. Strategic Systems Project Office. N00030–68–C–0092.

25—**Lockheed Aircraft,** Sunnyvale, Calif. $16,299,088. Sentinel system test target program. Strategic Systems Project Office. N00030–68–C–0308.

—**Raytheon Co.,** Sudbury, Mass. $7,925,000. Guidance system electronic assemblies and components for Poseidon missiles. Strategic Systems Project Office. N00030–69–C–0127.

26—**Raytheon Co.,** Lexington, Mass. $9,070,994. Guidance and control components for Sparrow III missiles. Lowell, Mass. Naval Air Systems Command. N00019–69–C–0031.

27—**Raytheon Co.,** Portsmouth, R.I. $32,500,000. Sonar systems for eight attack submarines. Naval Ship Systems Command. N00024–69–C–1006.

—**LTV Aerospace Corp.,** Dallas, Tex, $56,688,991 (contract modification). A–7D aircraft. Naval Air Systems Command. N00019–67–C–0143.

—**General Electric,** West Lynn, Mass. $3,789,655. Spare parts for aircraft engines. Aviation Supply Office, Philadelphia, Pa. F34601–68–D–2463–GB29.

—**Bayfield Industries,** Dallas, Tex. $2,662,500. MK 15, MOD 2, retard bomb fins. Carrolltan, Tex. Navy Ships Parts Control Center, Mechanicsurg, Pa. N00104–69–C–0180.

—**Palmetto Construction Co.,** Charleston, S.C. $2,469,711. Construction of an aircraft hanger at Charleston AFB, S.C. Naval Facilities Engineering Command. N62467–67–C–0383.

—**Bunker Ramo Corp.,** Silver Spring, Md. $1,835,000. External stores systems for electronic equipment. Canoga Park, Calif. Navy Air Development Center, Johnsville, Pa. N62269–68–C–0836.

—**Cardan Co.,** Los Angeles, Calif. $1,499,000. Construction of a research and development building. China Lake, Calif. Naval Facilities Engineering Command. N62473–67–C–3138.

—**Phoenix General Construction Co.,** Dallas, Tex. $1,371,914. Construction on a vertical missile packaging building at the Naval Weapons Station, Charleston, S.C. Naval Facilities Engineering Command. N62467–68–C–0175.

—**Hercules, Inc.,** Wilmington, Del. $1,106,381. Solid propellant research and development. Cumberland, Md. Naval Ordnance Systems Command. N00017–69–C–4405.

DEPARTMENT OF THE AIR FORCE

1—**Wall Colomony Corp.,** San Antonio, Tex. $1,607,011. Repair of jet engine parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–69–D–0623–0001.

—**Perkin-Elmer Corp.,** Norwalk, Conn. $1,774,600. Production of camera systems for RA–5C aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah, F42600–69–C–0867.

—**Honeywell, Inc.,** Hopkins, Minn. $24,915,000. Production of land mines and associated equipment. Armament Development Test Center, Eglin AFB, Fla. F08635–69–C–0015.

4—**AVCO Corp.,** Wilmington, Mass. $5,495,000. Development and production of missile penetration aids. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif. F04701–68–C–0021–P011.

—**General Electric,** Arkansas City, Kan. $3,441,986. Overhaul and modification of J–85 engines and components. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–68–C–3937.

—**General Electric,** West Lynn, Mass. $2,000,000 (contract modification). Component improvement program for T–64 aircraft engines. Aeronautical Systems Div., (AFSC), Wrigbt-Patterson AFB, Ohio, F33657–68–C–0713–P003.

—**United Aircraft of Canada,** Longueuil, Quebec, Canada. $2,270,393. Spare parts applicable to R4360 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383–93300A.

5—**Boeing Co.,** Wichita, Kan. $2,000,000. Modification kits for B–52 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–69–C–0699.

—**Lear Siegler, Inc.,** Santa Monica, Calif. $1,088,415. Production of flight control systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0340.

—**Westinghouse Electronic Corp.,** Baltimore, Md. $3,941,500. Development of attack radar for the F–X aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0550.

—**Hughes Aircraft,** Culver City, Calif. $3,941,500. Development of attack radar for the F–X aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0549.

7—**Oshkosh Truck Corp.,** Oshkosh, Wis. $1,292,750. Remanufacture of an estimated

159 snow removal vehicles to a like-new configuration. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–D–0002.

—**North American Rockwell Corp.,** Tulsa, Okla. $1,207,000. Overhaul and repair of air ground missiles. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04601–68–C–4486.

—**United Aircraft,** Windsor Locks, Conn. $1,418,345. Modification and/or overhaul of propeller hub and blade assemblies for C–130A/D aircraft. East Granby, Conn. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–D–0296 (0001).

—**United Aircraft,** Eash Hartford, Conn. $1,024,480. Production of spare parts for J–57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383–69000A.

8—**Dynamics Corp. of America,** Garden City, N.Y. $3,956,013. Production of kits for the modification of radar bombing systems. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–67–C–1676 P012.

—**Browning Construction Co.,** San Antonio, Tex. $1,933,000. Construction of 100 family housing units at Laughlin AFB, Tex. Laughlin AFB, Tex. F41685–69–C–0047.

12—**Chromally American** Corp., San Antonio, Tex. $1,551,192. Repair and application of protective metallic coating on compressor blades for J57 and J75 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–68–D–1617–0012.

—**General Electric,** Ontario, Calif. $1,570,-797. Overhaul and modification of J–79 engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–69–C–0261.

—**Northrop Corp.,** Hawthonre, Calif. $8,-467,000. FY 1969 procurement of F–5 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–1036–P0001.

13—**Lockheed Aircraft,** Marietta, Ga. $2,-489,804. Specialized engineering services for C–130 fatigue analysis programs. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–C–1335–P003.

—**General Dynamics,** Fort Worth, Tex. $2,-360,192. A combat operational training test and evaluation radar set. Rome Air Development Center, Griffiss AFB, N.Y. F30602–69–C–0070.

14—**General Electric,** West Lynn, Mass. $6,-030,000. Production of T–64 turboshaft engines for HH–53 helicopters. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0458–P007.

—**R. G. LeTourneau, Inc.,** Longview, Tex. $1,121,749. Model 83 truck lifts, accessories and spare parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–69–D–6504–001.

15—**Lockheed Aircraft,** Marietta, Ga. $7,704,-218. Engineering, design fabrication and installation of a modified wing in C–130 B/E aircraft. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–C–2530–P001.

18—**Hughes Aircraft,** Fullerton, Calif. $7,-720,000. Development of a sensor reporting post including a computer program and related service. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass.

—**United Aircraft,** East Hartford, Conn. $5,725,337. Production of spare parts for J–57 aircraft engines. San Antonio Ai Materiel Area, (AFLC), Kelly AFB, Tex. N383–69000A.

—**Tasker Industries,** Van Nuys, Calif. $1,-328,087. Development of a radar system for Air Defense. Armament Development & Test Center, Eglin AFB, Fla. F08635–69–C–0100.

20—**Itek Corp.,** Palo Alto, Calif. $3,605,875. Production of radar warning and homing equipment. Sunnyvale, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F04606–67–A–1818.

21—**Varo, Inc.,** Garland, Tex. $2,901,420. Production of ejection racks for F–100 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–C–1481.

—**Marwais Steel Co.,** Richmond, Calif. $2-342,215. Production of steel arch aircraft shelters. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33601–68–C–1135.

—**Brooks & Perkins, Inc.,** Detroit, Mich. $1,788,000. Production of large pallets used with the mechanized loading and unloading of air cargo. Cadillac , Mich. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–A–0039.

—**Control Data Corp.,** Minneapolis, Minn. $1,552,840. Rental and maintenance of automatic data processing equipment. Cape Kennedy Air Force Station, Fla. and Patrick AFB, Fla. Air Force Eastern Test Range, Fla. F08650–69–M–9984.

—**Bunker-Ramo Corp.,** Canoga Park, Calif. $1,449,977. Production of display consoles. Rome Air Development Center. Griffis AB, N.Y. F30602–68–C–0221.

22—**Lockheed Aircraft,** Marietta, Ga. $38,916,-780. Production of C–130E aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0249.

—**General Electric,** West Lynn, Mass. $12,-999,200. Production of turboshaft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0124–P001.

—**Preston Dairy Products,** Bunkburnett, Tex. $1,655,368. Dairy products for troop issue, hospital, and resale requirements for Lackland AFB, Kelly AFB, and Brooks AFB, Tex. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41615–69–C–70154.

25—**North American Rockwell Corp.,** Anaheim Calif. $14,500,000. Production of post boost propulsion subsystems for Minuteman III missiles. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701–68–C–0280.

—**Hughes Aircraft,** Culver City, Calif. $1,000,000. Development of a radar system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33651–69–C–1148.

26—**Honeywell, Inc.,** Hopkins, Minn. $12,209-000. Production of bomb components. Armament Development & Test Center, Eglin AFB, Fla. F08635–69–C–0018.

—**Department of Public Works,** Anchorage, Alaska. $1,622,650. Conveyance. disposal and treatment of sewage at Elmendorf AFB, Alaska. Base Procurement Office, Elmendorf AFB, Alaska. AF65501–69–C–0358.

—**Avco Corp.,** Everett, Mass. $1,142,000. Operation and maintenance of airborne optical equipment. Space & Missile Systems Div., (AFSC), Norton AFB, Calif. F04701–69–C–0102.

27—**Batesville Mfg. Co.,** Batesville, Ark. $1,-181,293 Production of bomb components. Armament Development Test Center, Eglin AFB, Fla. F33657–68–C–0850.

—**Automatic Switch Co.,** Florham Park, N.J. $2,325,624. Production of automatic electrical switching units. DACA 13–69–C–0003.

—**Republic Electric & Development Co.,** Washington, Ill. $1,149,296. Production of diesel engine generator control assemblies. DACA 13–69–C–0002.

29—**Litton Systems ,**Woodland Hills, Calif. $6,349,977. Production of avionics subsystems for F–4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0294.

—**Continental Aviation & Engineering Corp.,** Detroit, Mich. $1.483,875. Production of J69 aircraft engines. Toledo, Ohio. Aeronautical Systems Div,, (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0294.

—**General Electric,** West Lynn, Mass .$24,-586,800. Turboshaft engines for T–2C aircraft. Aeronautical Systems Div., (AFSC). Wright-Patterson AFB, Ohio. F33657–69–C–0005–P001.

—**IBM Corp.,** Cape Kennedy, Fla. $1,431,-674. Rental and maintenance of automatic data processing equipment at Patrick AFB, Fla. Air Force Eastern Test Range, (AFSC), Patrick AFB, Fla. F08650–69–C–9985.

—**Gary Aircraft Corp.,** Victoria, Tex. $1,-755,275. Inspection and repair of C–54 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–C–0936.

Small Business Size

(Continued from page 16)

consideration to the submissions and to any oral presentations which it wishes to hear, and then presents a written recommendation to the Administrator. The Administrator's decision is based upon the entire record, with due consideration to the advice of the board. When a conclusion is reached, all parties concerned are informed of the results and of the reasoning behind the decision.

The number of size appeal cases decided annually since the board was established in 1961 has fluctuated, but the general trend has been upward. During FY 1962, the first full year of operation, 30 cases were decided. Since that time the case load has increased to 51 in FY 1968, with a high of 61 in FY 1967. Over approximately seven and a half years, a total of 322 cases have been handled by the Appeals Board.

The figures cited verify the recognition by SBA of the issue of relativity in size determinations mentioned at the beginning of this article. Every appeal processed is an assurance that unique situations will not be ignored; every change in the standards or procedures is recognition that business and its environment is in a constant state of change. SBA strives to remain aware of those changes and to keep its size standards, which are relative, in consonance with reality. Because of this responsiveness to business conditions, defense-oriented firms may find themselves, their competitors, or their subcontractors qualified for special programs of assistance. It is always worth knowing that your firm is entitled to something new.

Changing Address?

The *Defense Industry Bulletin* converted to a computer-prepared mailing list a few months ago. Now, when requesting a change in address or a deletion, subscribers must send the mailing label from the back cover of the magazine. Without this label, changes in address or deletions cannot be effected. Changes and labels should be sent to the Editor, Defense Industry Bulletin, OASD (Public Affairs), Room 1E764, The Pentagon, Washington, D.C. 20301.

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Navy Given Go-Ahead on "Quiet" Submarine Program

The Defense Department has given permission for the Navy to proceed with building a nuclear-propelled, turbine electric drive submarine, Secretary of Defense Clark M. Clifford announced.

He explained that two new attack submarines had been proposed. One is a new, high-speed submarine. "It will not only be fast, it also will be quiet and will carry the most effective weapons and other devices procurable," he said. On July 1, 1968, he ordered this submarine to be built.

The turbine electric drive submarine, the so-called "quiet" submarine is a different program with different objectives. The program calls for construction of one boat. The "quiet" submarine will have a new kind of propulsion system, and newer and quieter machinery.

"Quietness is a great advantage in a submarine. The quieter it is, the better it can perform any function without being detected and destroyed by an enemy," Secretary Clifford explained. "Future U.S. submarines will emphasize quietness to an even greater extent than do our existing designs—which are the quietest in the world."

Achieving quietness is an art. Various quieting devices must be tried in an actual submarine to accurately assess their value. The turbine electric drive submarine will permit testing of various combinations of quieting measures that can be used in other submarines if found to be effective.

"The submarine built will be more than a test bed," Mr. Clifford said. "It will carry weapons and other devices and should provide us with a very silent and useful operational submarine."

Electric Boat Division, General Dynamics Corp., Groton, Conn., was authorized $22 million by the Navy to plan for and procure materials and equipment for construction of the submarine, SSN-685.

Cost of the "quiet" submarine is estimated at $150 million to $200 million, compared with about $78 million for a new Sturgeon class nuclear attack submarine. Concurrently, the Navy is working on 29 additional Sturgeon class submarines.

U.S. and U.K To Combine Fuel Cell Research

The United States and the United Kingdom have agreed to cooperate on power generating fuel cells research. The countries will pool efforts to achieve a better understanding of the fundamental processes involved in fuel cell systems.

Areas of research will center principally on optimum choice of materials for use as anodes, cathodes, electrolytes, and fuels, and the most efficient structure to use these materials.

Both countries have been conducting extensive research and development work in fuel cells for some time. The new agreement formalizes collaboration by the two governments. Work will center on efforts to design more economical and effective fuel cell systems.

The program is expected to run for three years. Work will be performed through contracts with university and industrial laboratories, and in government facilities.

The U.K. Ministry of Defence (Navy Department) and the U. S. Army are directing the program for their respective countries.

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